NEW APPLICATION



# Application for a Certificate of Environmental Compatibility

**P**anda Gila River Project

Prepared for State of Arizona Power Plant Ind Transmission Line Siting Committee

> Submitted by Panda Gila River L.P.

> > **ON:**KET NO

JAN 2 0 2000

Case No 000 0-00-00

# NEW APPLICATION

# PANDA GILA RIVER, E.P.



A Panda Company\_

2000 JAN 20 P 4: 28

January 20, 2000

AZ CORP COMMISSION DOCUMENT CONTROL

Ms. Deborah Scott Director, Utilities Division Arizona Corporation Commission 1200 West Washington Street Phoenix, AZ 85007

DOCKET NO. ( L - 000000-00-00-99

RE: Application for a Certificate Environmental Compatibility

Panda Gila River Project

Dear Ms. Scott:

Panda Gila River, L.P. (PGR) is pleased to provide an original and 25 copies of the attached Application for a Certificate of Environmental Compatibility (CEC) for the Panda Gila River Project. The Project includes four, natural-gas fired combined-cycle generating units, a switchyard and related facilities to be located in Town of Gila Bend, Maricopa County, Arizona.

Pursuant to the provisions of A.R.S. § 40-360.09, we have enclosed a check in the amount of \$10,000.00. We request the public hearing before the Power Plant and Transmission Line Siting Committee for consideration of this Application be set the first week in March 2000, or the first available date.

PGR is looking forward to working with your staff on this project. If you have any questions, please contact Jeff Schroeter at 972-980-7159.

Sincerely,

T. Edward McDaniel

**Project Director** 

Cc: J. Schroeter - PGR

## BEFORE THE POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

In the matter of the Application of Panda	)	
Gila River, L.P. or their assignee(s), in	)	
conformance with the requirements of	)	
Arizona Revised Statutes 40-360.03 and	)	
40-360.06, for a Certificate of Environmental	)	
Compatibility authorizing the construction	)	
of natural gas-fired, combined cycle	) Case No	
generating plant, switchyard, and related	)	
facilities in the Town of Gila Bend,	)	
Maricopa County, Arizona located in	)	
Sections 8, 17, 20, and 21, Township 5	)	
South, Range 4 West, Gila and Salt River	)	
Base and Meridian.	)	
	)	

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Panda Gila River Project

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#### **INTRODUCTION**

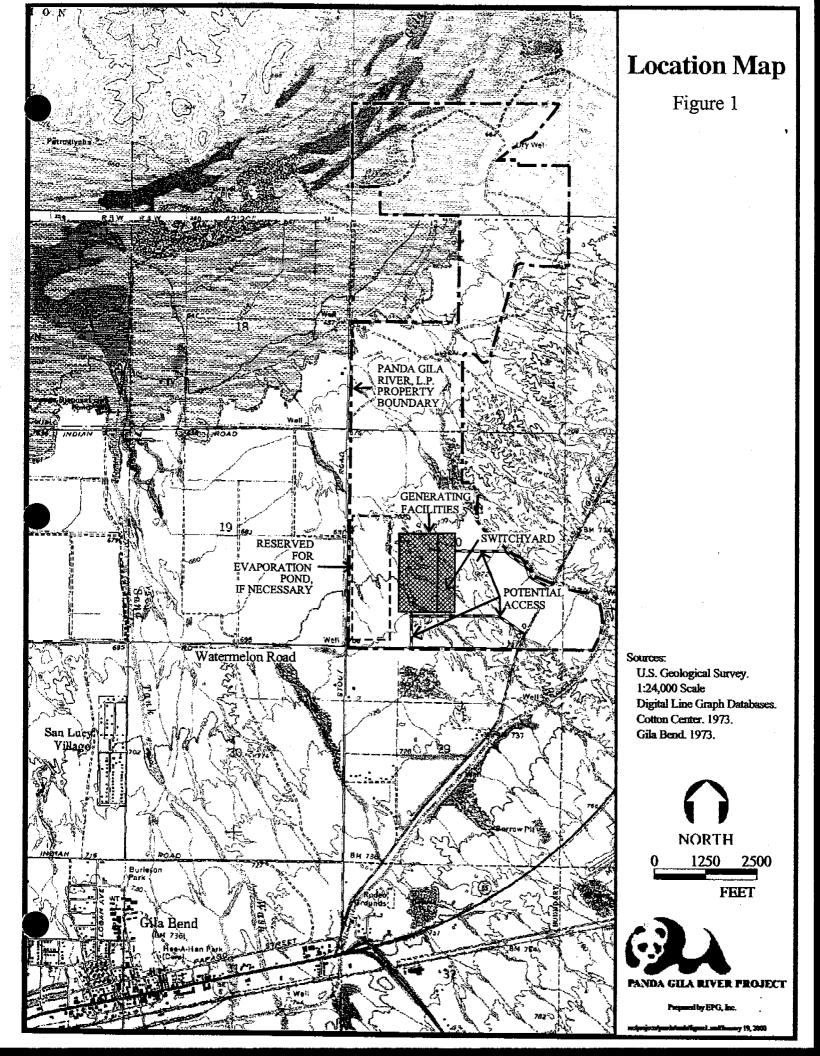
The Panda Gila River, L.P. (Applicant), which proposes to develop, construct, own, and operate the Panda Gila River Project (project), requests a Certificate of Environmental Compatibility from the Arizona Power Plant and Transmission Line Siting Committee (Siting Committee). The proposed project will use advanced technology, high-efficiency gas combustion turbines in a combined cycle design producing an average of 2,080 megawatts (MW). Construction is scheduled to begin in December 2000 with complete build-out of the 2,080 MW facility in 2003. Panda Gila River, L.P. is an affiliate of Panda Energy International, Inc., an independent power company engaged principally in the development, acquisition, and ownership of electric power generation facilities in the United States and abroad.

The proposed project includes four combined cycle units—Units 1, 2, 3, and 4. Each of the four generating units will be nominally rated at approximately 520 MW. All four units will be designed to operate in the combined cycle mode to provide a base load power supply, or cycle to follow power market demands. The project will produce reliable, low cost, environmentally friendly energy for the growing Southwest.

The proposed project will be located approximately 75 miles southwest of Phoenix, Arizona, in Maricopa County within the jurisdiction of the Town of Gila Bend, Arizona (Figure 1). Site advantages include the following:

- accepted in Gila Bend as a positive step towards meeting the Town's economic development goals
- adequate water supply
- low population density in vicinity of site
- adequate access to site
- available interconnection with existing transmission system
- proximity to natural gas line

Interconnection into the Western States Coordinating Council transmission grid will be completed by a regional utility company and is not requested by the Applicant in this filing. The anticipated route and other alternative routes were previously evaluated by the Bureau of Land Management (BLM) in their Resource Management Plan, Liberty to Gila Bend 230kV Transmission Line Environmental Assessment (EA), and APS/SDG&E Transmission Line Environmental Impact Statement (EIS).







#### ARIZONA CORPORATION COMMISSION

January 4, 2000

IN THE MATTER OF THE APPLICATION OF	)	
PANDA GILA RIVER, L.P. OR THEIR ASSIGNEE(S)	)	
IN CONFORMANCE WITH THE REQUIREMENTS	)	
OF ARIZONA REVISED STATUTES §40-360.03 AND	)	
§40-360.06, FOR A CERTIFICATE OF	)	
ENVIRONMENTAL COMPATIBILITY AUTHORIZING	G)	CASE NO. <u>L-00000Q-00-0099</u>
THE CONSTRUCTION OF A NATURAL GAS-FIRED,	)	
COMBINED CYCLE GENERATING PLANT,	)	
SWITCHYARD AND RELATED FACILITIES IN THE	)	
TOWN OF GILA BEND, MARICOPA COUNTY,	)	
ARIZONA LOCATED IN SECTIONS 8, 17, 20, AND 21	<u>,</u> )	
TOWNSHIP 5 SOUTH, RANGE 4 WEST, GILA AND	)	
SALT RIVER BASE AND MERIDIAN.	)	

Attached is a copy of Check No. 003719, drawn on the Comeria Bank-Texas, which we received from Panda Energy Management Corp, in the amount of Ten Thousand Dollars, (\$10,000.00) to cover the filing fees for the above captioned case.

Very truly yours,

Manay Cole Nancy Cole

cc:

Docket Administrator, Utilities Division

Enclosure: 1

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Charles Pierson, Assistant Attorney General

Linda Schall, Business Manager

T. Edward McDaniel, Project Director

The potential pipeline corridor was studied by Dames & Moore who completed land use, cultural, and biological surveys. Because the pipeline would generally cross areas previously disturbed or follow existing roads, no significant environmental resources would be impacted by the planned pipeline. Options for the gas pipeline right-of-way are being secured by Panda Gila River Pipeline, LLC.

This application includes the environmental evaluation and documentation regarding the proposed project as specified by Arizona Administrative Code Rule R14-3-219. The proposed project will provide environmental controls to ensure that the project meets or exceeds regulations that protect air and water resources. In summary, potential impacts will be avoided and minimized as follows:

- Water to meet project needs will be obtained from on-site groundwater supply wells. Results of the groundwater analysis show that there is a sufficient supply of groundwater for cooling and other uses during project operation, and that any future drawdown would not interfere with the production potential of wells in the area over the life of the project.
- The project would achieve a high degree of water conservation through a waste minimization system. This treatment process maximizes the number of cooling cycles and provides for internal recycling that reduces discharge and water consumption. The project is in negotiation with the Town of Gila Bend to dispose and process the project's waste streams (sanitary sewers, cooling tower blowdown, etc.).
- Based upon field investigations and analysis, the project would have minimal or no impact on any threatened or endangered species or critical habitat.
- The proposed project would have minimal adverse effects on land use, cultural resources, air quality, or noise receptors.
- The project has addressed visual impacts of the site through careful siting of the plant away from sensitive viewpoints. The plant layout would include landscaping and selection of final color of facilities to minimize visual impacts.

The project will create new job opportunities for residents of Gila Bend and Maricopa County. The project will provide over 1,000 jobs on-site during peak construction. Much of the estimated \$50 million construction payroll will be spent locally, significantly boosting the area's economy. Approximately 60 full-time permanent jobs will be created. The annual payroll is projected to exceed \$3 million. During construction, the project will purchase \$10 to \$15 million in local materials and services. Once operation has begun, \$5 to \$8 million in local purchases will be made each year. The project will contribute approximately \$2 to \$3 million in taxes to the community and schools. Approximately 200 additional secondary jobs will be created during construction and plant operation.

The Applicant has conducted an extensive public involvement program to provide information to the community and identify potential issues and concerns (see Exhibit J). The program has included (1) discussions with individuals and community leaders, (2) presentations for

government agencies and officials, (3) public meeting with the Gila Bend Town Council, and (4) public open house and presentation held in the project area. In addition, a newsletter was distributed in October 1999 and a second newsletter will be mailed prior to the hearing. A dedicated telephone line was established to provide information to the public and receive feedback. This program will continue as the project proceeds and will be helpful in identifying and responding to community issues.

After evaluating the factors to be considered by the Siting Committee as defined in ARS §40-360.06, the Applicant has concluded that the proposed project is environmentally compatible.

## APPLICATION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY

1. Name and address of the applicant:

Name:

Panda Gila River, L.P.

Address:

4100 Spring Valley, Suite 1001

Dallas, TX 75244

Panda Gila River, L.P. may assign all or part of the project to other entities.

2. Name, address, and telephone number of a representative of the application who has access to technical knowledge and background information concerning this application, and who will be available to answer questions or furnish additional information:

Name:

Mr. Jeffrey W. Schroeter, P.E.

Vice President

Address:

4100 Spring Valley, Suite 1001

Dallas, TX 75244

Phone:

(972) 980-7159

Fax:

(972) 980-6815

E-mail:

ieffs@pandaenergy.com

3. State each date on which applicant has filed a ten-year plan in compliance with ARS §40-360.02, and designate each such filing in which the facilities for which this application is made were described. If they have not been previously described in a ten-year plan, state the reasons therefore.

Recent legislation (H.B. 2663) eliminated the need to file a 10-year plan for the contemplated construction of generation facilities.

- 4. Description of the proposed facilities:
  - 4.a. With respect to an electric generating plant:
    - 4.a.i. Type of generating facilities:

The Panda Gila River Project (project) is a natural gas-fired, combined-cycle electric generating plant. The plant will use advanced technology, high-efficiency gas combustion turbines in a combined cycle design producing a nominal of 2,080 MW. The project includes four combined cycle units—Units 1, 2, 3, and 4. The plant design will include power islands, a switchyard, control and administrative buildings, water-cooled

condensers with mechanical draft cooling towers, storage tanks, and other ancillary facilities.

Each of the four generating units will be nominally rated at approximately 520 MW. The project design will allow all four units to operate in the combined cycle mode to provide a base load power supply, or cycle to follow market power demands. Each 520 MW unit, therefore, has these basic components:

- two combustion turbine electric generators
- two heat recovery steam generators
- one steam turbine electric generator

An aerial photograph of the proposed project location is included as Figure 2. The supporting infrastructure includes vehicular access, water supply system, natural gas supply lines, intra-plant transmission, and a switchyard. Access to the project site will be directly west from Old Highway 80 and north from Watermelon Road across the Applicant's property. Conceptual site plans and photosimulations of the proposed facilities are provided in Exhibit G.

The combustion turbines use state-of-the-art technology to burn clean natural gas efficiently with reduced nitrogen oxide emissions relative to other generation options. Emissions control technology will be used to ensure compliance with air quality regulations (see Exhibit B-2, Air Quality).

#### 4.a.ii. Number and size of proposed units:

The project includes the following major components and systems as listed and described below. Each of the four combined-cycle units will be nominally rated at 520 MW, using two combustion turbines and one steam turbine. The project's generating facilities are shown on Figures G-1 and G-2 and include the following:

- site improvements, foundations, buildings, and structures
- eight evaporative inlet air coolers
- eight natural gas-fired combustion turbine electric generators (nominal 170 MW) with dry low nitrogen oxide combustors
- eight heat recovery steam generators with supplemental natural gas (duct) firing
- eight approximately 130-foot-tall exhaust stacks
- four condensing steam turbine electric generators (nominal 180 MW)
- four water-cooled condensers
- four 8- or 9-cell mechanical draft-cooling towers
- water handling and wastewater treatment facilities

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- natural gas handling system
- switchyard and interconnection facilities
- automated instrumentation and control systems
- emergency diesel-fueled firewater pump engine
- emergency diesel-fueled electric generator

#### 4.a.ii.1. Combustion Turbine Generator

The combustion turbine converts the thermal energy produced by the combustion of natural gas into mechanical energy required to drive the generator and combustion turbine compressor. Air is compressed in the combustion turbine, then combined with natural gas. This air-fuel mixture is then burned in the turbine combustors. The hot gases from the combustion process are expanded through a turbine, which in turn spins an electric generator to produce electricity. Exhaust gas from the combustion turbine generators is then routed through ducts to a heat recovery steam generator, which is a boiler designed to recover the heat from the exhaust gas and use this heat to generate steam. A duct burner will be used supplementally to fire the heat recovery steam generator during periods of peak power demand. The heat recovery steam generator substantially removes the remaining heat in the gas and exhausts the residual through stacks. The stacks contain continuous emission monitors to ensure that air emission standards are not exceeded.

Auxiliary systems required for combustion turbine operation include inlet air filters, inlet air evaporative coolers, oil lubrication and cooling systems, fuel gas delivery and ignition system, fire protection, sound reduction equipment, and instrumentation/control devices.

#### 4.a.ii.2. Heat Recovery Steam Generator

The heat recovery steam generator transfers heat from combustion turbine exhaust gases to feedwater to produce steam for the steam turbine operation. The heat recovery steam generator is designed and constructed to operate at the maximum exhaust gas flow and temperature ranges of the combustion turbine. The heat recovery steam generator also is designed for outdoor installation.

The heat recovery steam generator consists of a condensate preheater, a low-pressure section, an intermediate pressure section, and a high-pressure steam section. The heat recovery steam generator, which utilizes the exhaust heat from the combustion turbines, preheats the feedwater, which then passes through the pressure sections of the heat recovery steam generator until the steam reaches the required temperature (i.e., 1,050 degrees Fahrenheit) and pressure (i.e., 1,900 psig) for use in the steam turbine. The conditioned steam is then piped to the steam turbine to generate additional electricity.

#### 4.a.ii.3. Steam Turbine Generator

The final step in the combined cycle process uses a steam turbine generator to produce electricity. Steam from the heat recovery steam generator is piped under pressure to a steam turbine generator. The steam turns the turbine blades attached to a shaft. The shaft is attached to an electrical generator. The steam turbine generators will generate approximately 180 MW each.

The steam turbine package includes a lube oil system, gland condenser, automatic sealing system, and supervisory control panel. The turbine lube oil and generator are cooled via the plant's closed cooling water system.

#### 4.a.ii.4. Air Pollution Control System

The use of pipeline quality natural gas and good combustion practices will minimize nitrogen oxides, sulphur dioxide, particulate matter emissions, and volatile organic compound emissions. The project will meet or exceed all applicable air emissions requirements. A more detailed discussion of emission control equipment and emission rates is contained in Exhibit B-2.

#### 4.a.ii.5. Water Handling and Treatment Facilities

The major on-site water handling and treatment facilities include the steam system, feedwater and condensate systems, circulating water system, service water system, fire protection, make-up water treatment system, and wastewater treatment system.

The wastewater sources include the pretreatment wastes, demineralized regeneration wastes, heat recovery steam generator blowdown, cooling tower blowdown, roof and floor drains, and some rainfall runoff. Stormwater is routed to an oil/water separator before being sent to an on-site retention area.

The water treatment system may include filtration, reverse osmosis, and demineralizers depending on the water quality and the water system needed.

The waste minimization system will take the clarifier effluent and extract and recover its water, and generate solids for suitable disposal by truck to an off-site landfill. The clarifier effluent shall first pass through appropriate filters as pretreatment to reverse osmosis (RO) units. The RO units will concentrate the effluent and recycle the RO permeate back to the cooling tower. The concentrate (or the reject) stream from the RO units will be forwarded to an evaporator to further concentrate the RO reject. Slurry from the evaporator will be sent to a crystallizer for final extraction of water from the slurry. After final water extraction, the crystallizer generates solids for disposal. Distillate from the evaporator will be forwarded to the makeup demineralizer system. The waste minimization facility will be sized to assure that cooling tower chemistry can be adequately maintained.

#### 4.a.ii.6. Fuel System

The purpose of the fuel (natural gas) system is to transfer, meter, filter, and regulate pressure of the natural gas main interconnection to the combustion turbine combustors (and the heat recovery steam generator duct burner systems). Natural gas (pipeline quality, low sulfur) will be obtained from a new natural gas main at the plant boundary. The gas is piped underground from the plant boundary, where it is metered, to the combustion turbine area and split to the individual combustion turbine fuel gas skids (and heat recovery steam generator duct burner system). An affiliate of the Applicant will own the new interconnecting pipeline lateral. The lateral will be operated in accordance with applicable Department of Transportation, Arizona Corporation Commission, and other agency rules.

The natural gas system includes conditioning equipment to ensure that the gas delivered to the combustion turbines (and duct burner systems and the auxiliary boiler) meets the manufacturer's specification concerning maximum particulate levels and entrained liquid content. Entrained particles must be kept to a minimum to prevent erosion and plugging of fuel system nozzles and sticking or jamming of control equipment.

#### 4.a.ii.7. Instrumentation and Control System

The project will use a digital process control system suitable for use in power plants. The control interface will be in a control/administration building on the site. The system is a programmable control system designed to achieve maximum availability and reliability with the least staffing requirements.

#### 4.a.ii.8. Switchyard and Electrical Interconnection

The generator of each combustion turbine set is connected to the high-voltage switchyard via the generator leads and the generator step-up transformer. Unit breakers are provided in the switchyard to connect each unit to the grid.

Auxiliary power for the generating units will be tapped from the generator leads of the combustion turbines. These taps supply power to the switchgear via the unit auxiliary transformer. A generator breaker is provided between each generator and the tap to allow the grid to supply auxiliary power to the plant via the generator step-up transformers when the combustion turbines are not operating. The generator breaker is used to synchronize the combustion turbine generator to the grid. The plant auxiliary switchgear is arranged so that all plant auxiliaries can be supplied from either combustion turbine generator.

The steam turbine generator also is provided with a generator breaker, which is used to synchronize the steam turbine generator to the grid, but has no tap on the generator leads. The steam turbine generator has the same three winding step-up transformers with one combustion turbine.

The switchyard is expected to be a conventional open air, breaker and one-half bus design consisting of high-voltage power circuit breakers, disconnect switches, grounding switches, potential transformers, surge arresters, substation steel structures, and protective relaying equipment.

#### 4.a.ii.9. Site Improvements

Access to the project will occur from Old Highway 80 to the east and from Watermelon Road to the south. The necessary on-site roads and parking will be provided to permit normal operations, maintenance (including major equipment overhauls), and delivery of bulk materials. The site area will be graded to route stormwater to an on-site retention area. Site security and lighting also will be provided as required.

On-site bulk storage of critical materials will be provided to permit continued operation during certain component or system maintenance operations or material supply interruptions. Bulk storage of acid and caustic for cycle make-up water system regeneration and waste neutralization will be provided in the project design.

4.a.iii. The source and type of fuel to be used, including a proximate analysis of fossil fuels:

The project will use natural gas provided to the plant from an existing El Paso Natural Gas pipeline approximately 19 miles north of the site. The expected interconnection is shown on Figure 3. A typical analysis of the natural gas that will be used is outlined on Table 1.

TABLE 1 NATURAL GAS ANALYSIS		
Component	Normalized %	
Methane	97.05	
Ethane	1.02	
Propane	0.10	
Isobutene	0.01	
n-Butane	0.02	
Hexane plus	0.02	
Carbon Dioxide	1.36	
Nitrogen	0.42	
Total	100.00	

Note: Isopenane and n-Pentane were 0.0 in the analysis.

Specific Gravity = 0.576

Moisture Heating Value (Btu @ 14.73 dry) = 1006.0

Source: El Paso Natural Gas Company

#### 4.a.iv. Amount of fuel to be utilized daily, monthly, and yearly:

The project could use the following amounts (expressed as higher heating value):

Daily - 353,000 million British thermal units (MMBtu)/hour

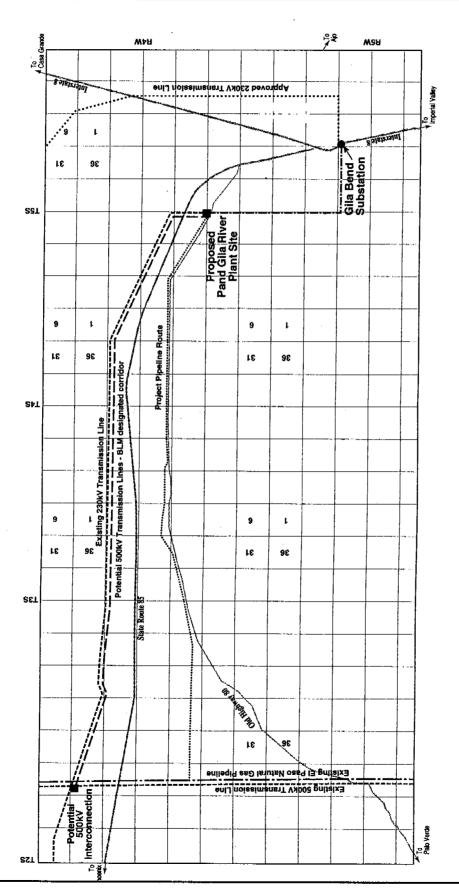
Monthly – 10,672,000 MMBtu/month Yearly – 128,679,000 MMBtu)/year

Fuel use varies with ambient air temperature, actual number of hours of duct burners, combustion turbine operation, and start-up/shut-down conditions. The above is based on 73 degrees Fahrenheit, 50 percent duct burners, 94 percent capacity factor, and 500 starts per 520 MW unit. These amounts of fuel use would result from the example data point at the conditions described above, and may not depict the actual operations of the plant.









4.a.v. Type of cooling to be utilized and the source of any water to be utilized:

#### 4.a.v.1. *Type of cooling*:

The project will use evaporative or wet cooling for both the combustion turbine inlets and for circulating water cooling in the cooling towers.

#### 4.a.v.2. Source of water:

Cooling water required for the project would be obtained from the on-site groundwater supply wells. The project would achieve a high degree of water conservation through a designed waste minimization system. This treatment process maximizes the number of cooling cycles and provides for internal recycling that reduces discharge and water consumption. Supply water is pretreated as necessary to maximize the cycles of concentration in the cooling tower.

The potable water for the work force needed to construct and operate the plant will come from the Town of Gila Bend.

The discharge from the process is primarily cooling tower blowdown, which is sent to the waste minimization system. Approximately 95 percent of the cooling tower blowdown is recovered and returned to the plant for reuse. The Applicant and the Town are currently examining the possibility of disposing and processing discharge through a local, publicly owned treatment works. Otherwise, discharge from the waste minimization system would be sent to a 65- to 80-acre pond for final evaporation.

4.a.vi. Proposed height of stacks and number of stacks, if any:

The project would have two stacks for each 520 MW unit, for a total of eight. Each stack will be approximately 130 feet in height.

4.a.vii. Dates for scheduled start up and firm operation of each unit and date construction must commence in order to meet schedules:

The project is scheduled to be completed by the second quarter of 2003. In order to meet that schedule, construction must commence by December 2000. The scheduled start-up and commercial operation for each unit is as follows:

Unit	Start-up	Commercial Operation Date
1	December 2001	June 2002
2	February 2002	August 2002
3	July 2002	January 2003
4	November 2002	April 2003

#### 4.a.vii.1.Project Construction

A primary contractor will perform the engineering, procurement, and construction for the project. The actual construction in the field should be completed in 30 to 36 months. During this period, the construction work force will average approximately 490 people on-site, peaking at 1,030. An area adjacent to the plant will be used temporarily for construction parking, work trailers, storage, and laydown areas. Water and electrical power facilities are available at the site for use during construction.

#### 4.a.vii.2. Project Operation

The proposed design of the plant allows for base load operations, part load operations, and peak load operations. The level of output of the facility will be determined by market factors, such as the growth in energy demands and daily wholesale energy prices.

The project is designed for base load combined cycle operation. The combustion turbines can be fired in 10 to 15 minutes and reach full load output in four hours or less, depending on the ambient condition of the steam plant. The project also can perform over a range of power output from approximately 150 to approximately 2080 MW depending on the ambient temperature conditions and mode of operations. As ambient temperatures increase, evaporative coolers will be turned on to drop the air inlet temperatures close to the wet bulb temperature to maximize plant output. The duct burner systems are used during periods of peak power demand.

The project will include advanced control systems to monitor and control all of the plant operation systems. Approximately 60 full-time staff will perform routine operation and maintenance functions. In addition, the plant can be remotely monitored and dispatched. Some functions, including major turbine and generator maintenance, will be outsourced to other vendors.

4.a.viii. To the extent available, the estimated costs of the proposed facilities and site, stated separately:

The cost of the project (excluding transmission interconnects, pipelines, and related facilities) is estimated to be in excess of \$600 million.

4.a.ix. Legal description of the proposed site:

Portions of Sections 8, 17, 20, and 21, Township 5 South, Range 4 West in the Town of Gila Bend, Maricopa County, Arizona, Gila and Salt River Base and Meridian.

4.b. Description of the proposed transmission line:

Interconnection into the Western States Coordinating Council transmission grid will be completed by a regional utility company and is not requested by the Applicant in this filing. The regional utility (or utilities) will apply for a separate Certificate of Environmental Compatibility to describe and permit the interconnecting transmission lines. In addition, the existing 230kV Liberty to Gila Bend transmission line also may be used as a delivery source. This regional utility company will provide the new 500kV transmission lines to interconnect with the existing 500kV Palo Verde to Kyrene line and possibly the switchyard (see Figure 3). The anticipated location for a new transmission line corridor would parallel an existing H-frame wood pole 230kV transmission line for its entire length of approximately 20 miles. This corridor has been identified by the BLM as a designated utility corridor.

#### 5. Jurisdictions:

5.a. Areas of jurisdiction (as defined in ARS  $\S$  40-360) affected by this route or site:

All components of the project will be entirely within Maricopa County. The Applicant is currently working with the Town of Gila Bend on amending their General Plan to revise the existing AG (agricultural) land use designation of the site to a Basic Manufacturing and Industrial Zone (I-3).

To complete the General Plan Amendment, the Town of Gila Bend has retained a consulting team. The planning process has been initiated and will include the preparation of land use and circulation scenarios for an approximately 5-square-mile area that includes the plant site, a forum with landowners and other stakeholders, and several public hearings. It is anticipated that this process will be completed by the second quarter of 2000.

#### 6. Description of the environmental studies the applicant has performed.

The Applicant contracted with the following consultants to perform detailed environmental studies for the proposed project.

Consultant	Environmental Studies
Environmental Planning Group, Inc. (EPG)	Land use, visual resources, public involvement
Dames & Moore	Simulations, water, cultural and biological resources
PCR Services Corporation	Acoustics/noise
JMC Consulting	Air resources
Duke/Fluor Daniel	Waste minimization and maximization of water use

Results of the environmental studies for the proposed project are presented in Exhibits A through I of this application. As previously described, environmental studies for the transmission line will be prepared by a regional utility who will file a separate Certificate of Environmental Compatibility application with the Siting Committee.

Environmental studies of the project area began with the collection of existing environmental data including literature, maps, and other agency data. Interviews were conducted with appropriate agencies and organizations. In addition to secondary data investigations, pedestrian surveys were completed for cultural and biological resources. Existing conditions were measured for noise while windshield surveys were completed to verify land use and visual resources. Visual simulations were prepared to assist in impact assessment and mitigation planning.

Environmental impacts were determined by comparing the existing environment with the proposed action. As a result of this analysis, potential impacts (visual and noise) were anticipated to the proposed Gatlin Site Cultural Park, as well as residences in two farmsteads. In order to avoid potential impacts to the Gatlin Site Cultural Park, the proposed facility was optimized and located within the southernmost portion of the property. This was accomplished by the Applicant purchasing additional land (approximately 140 acres). The site location will result in reduced or minimized visual and noise impacts to the proposed Gatlin Site Cultural Park. Additional mitigation measures will further reduce visual impacts to local residences and sensitive viewers in the Town of Gila Bend and along Old Highway 80 and State Route 85. Measures currently anticipated include facility coloring and landscaping (berming and vegetation planting).

The Applicant has been working with the Town of Gila Bend in developing conceptual mitigation plans to reduce potential visual and noise impacts. These discussions have resulted in conceptual plans for landscaping (berming and vegetation planting) on the site, and for a regional recreational/cultural development plan that evaluates the site in its local context (see Exhibit G). This work is continuing in conjunction with the Town of Gila Bend and preparation of the general plan amendment, to ensure that the site plan for the proposed plant meets the planning and economic goals of the Town of Gila Bend (see Exhibit J-4).

In summary, minimal impacts are anticipated to land use, recreation, visual, biological, noise, water, and cultural resources. Air impacts are anticipated to be minimal (the proposed project is located in an attainment area) by using state-of-the-art pollution control technology and continuous air emissions monitoring. Beneficial impacts are expected to the area's economy because of an increased tax base for the Town of Gila Bend and Maricopa County. Increased employment will result from the construction and operation of the plant and purchases within the local community to provide additional goods and services for the project.

The Applicant also conducted an extensive public involvement program that included numerous meetings with federal, state, county, and local city officials including the mayor, town manager, Town Council, and Chamber of Commerce (see Exhibit J). A public meeting, which included an open house and a presentation, and a public hearing before the Gila Bend Town Council were conducted. The Applicant also sent out a newsletter to all approximately 1,100 residences in the Gila Bend area, and will distribute a second newsletter prior to the hearing to the same mailing list. In addition, a public information line (in English and Spanish) was maintained since the project was announced. As of the time of filing this application, public feedback has been positive and generally related to the positive economic impact of the plant on the Town.

Finally, the Applicant has requested that APS provide transmission for the proposed project. Although system studies are not complete, it is our understanding that, at the time of this application, transmission could be provided three possible ways: (1) the existing Liberty to Gila Bend 230kV line; (2) the approved Gila Bend to Santa Rosa 230kV line, or (3) a new 500kV system of approximately 20 miles between the proposed project and the existing PVNGS to Kyrene 500kV line. The new 500kV transmission system would parallel an existing 230kV line its entire distance and be located within a 1-mile-wide Bureau of Land Management designated utility corridor. All of these alternatives are anticipated to have minimal to no environmental impacts based on the results of previous studies.

In summary, the Applicant chose the proposed site to minimize environmental impacts and public concern while providing maximum benefit to the community. The Town of Gila Bend has expressed their full cooperation and support to make this project a successful addition to their community. Because of the Applicant's experience in developing similar generation projects and the studies conducted by an expert team of consultants, the Applicant affirms the project is environmentally compatible. We, therefore, request a Certificate of Environmental Compatibility for the project at the proposed site.

#### PANDA GILA RIVER, L.P.

By: Jeffy W Schoeter

**Authorized Officer** 

ORIGINAL and 25 copies of the foregoing hand delivered and filed with the Director of Utilities, Arizona Corporation Commission,

this 20 day of January, 2000

#### EXHIBIT A LOCATION AND LAND USE MAPS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Where commercially available, a topographic map, 1:250,000 scale, showing the proposed plant site and the adjacent area within twenty (20) miles thereof. If application is made for alternative plant sites, all sites may be shown on the same map, if practicable, designed by applicant's order of preference."

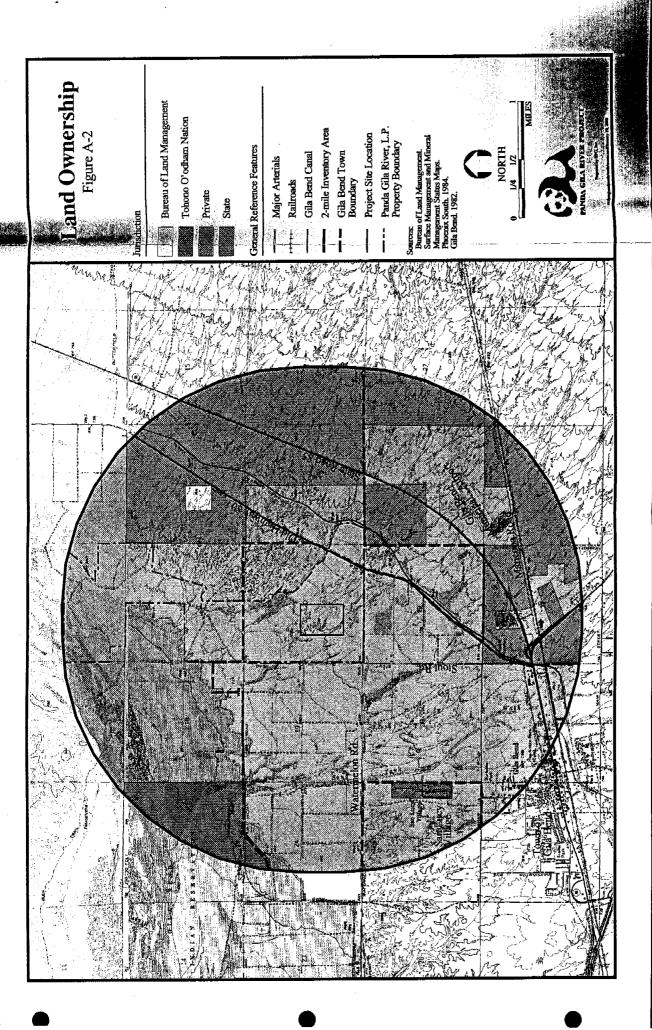
"Where commercially available, a topographic map, 1:62,500 scale, of each proposed plant site, showing the area within two (2) miles thereof. The general land use plan within this area shall be shown on the map, which shall also show the areas of jurisdiction affected and any boundaries between such areas of jurisdiction. If the general land use plan is uniform throughout the area depicted, it may be described in the legend in lieu of an overlay."

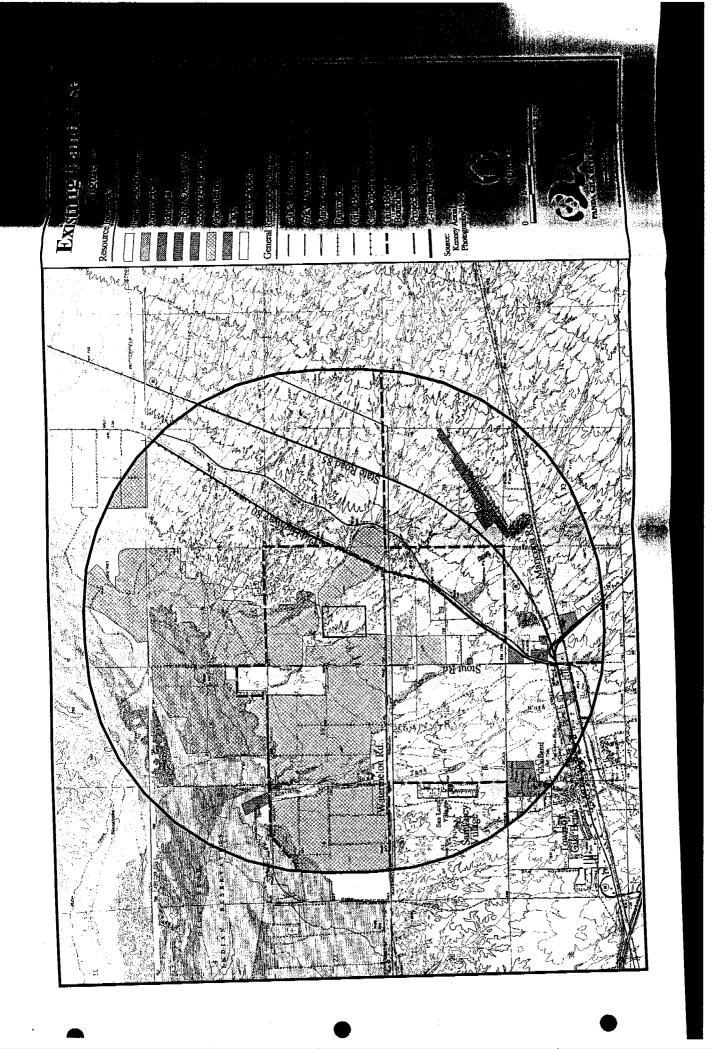
The following maps are included as exhibits:

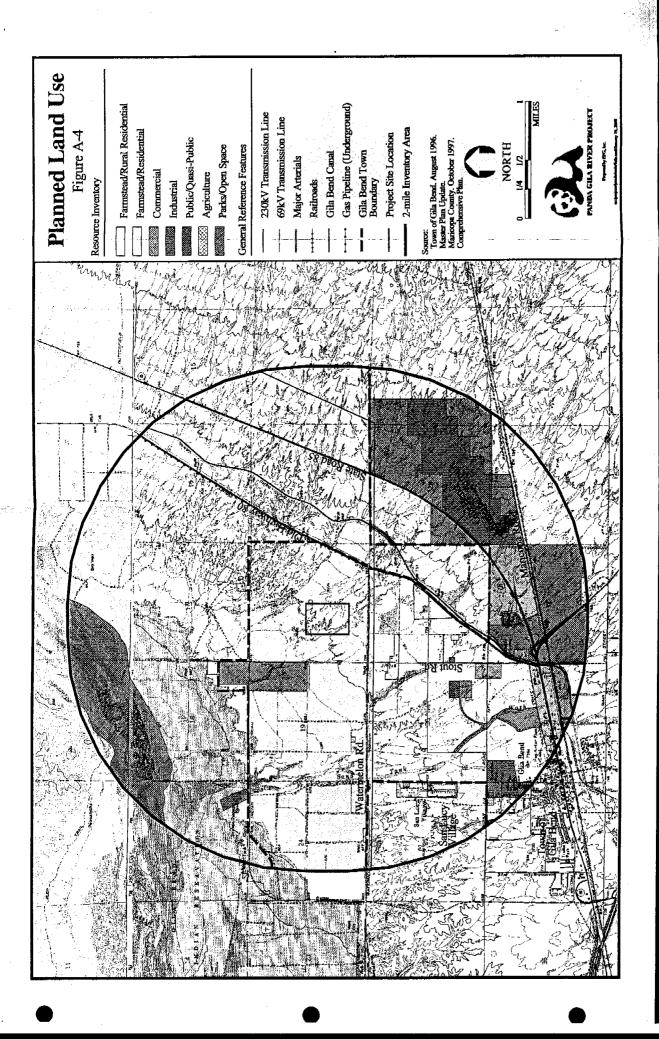
- Figure A-1 Project Location
- Figure A-2 Land Ownership
- Figure A-3 Existing Land Use
- Figure A-4 Planned Land Use

More detailed discussion of land ownership, existing and planned land use conditions and potential impacts on such resources within the vicinity of the project site is provided in Exhibit B-1.









#### EXHIBIT B ENVIRONMENTAL REPORTS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Attach any environmental studies which applicant has made or obtained in connection with the proposed site(s) or route(s). If an environmental report has been prepared for any Federal agency or if a Federal agency has prepared an environmental statement pursuant to Section 102 of the National Environmental Policy Act, a copy shall be included as part of this exhibit."

The Applicant completed environmental studies for the project between September 1999 and December 1999. The results of the environmental studies are summarized below:

#### LAND USE STUDY

The purpose of the land use study was to identify land use impacts that could result from the construction and operation of the proposed project. Potential impacts were defined as incompatibility or conflict with existing land uses or land use plans. The study inventoried land ownership, existing land uses, and planned land uses within two miles of the proposed plant, and an impact assessment was conducted. Overall, the area surrounding the site may be characterized as rural and agricultural. Two farmsteads are located within ½ mile of the proposed plant; farmsteads include residences within the farm complex. An additional 3 farmsteads and 19 individual residences are located between ½ and 1 mile from the project site. In addition, the Gatlin Site Cultural Park has been proposed for an area that would be approximately ¼ mile northwest of the plant. The majority of residential and other development in the area is located within the Town of Gila Bend, approximately 2 miles from the site, and San Lucy Village (a district of the Tohono O'odam Nation), approximately 2.5 miles from the site.

The Town of Gila Bend annexed the area where the site is located (Section 20), and zoned the area as agricultural to remain consistent with the previous County zoning. The Town has initiated the planning process for a general plan amendment to address the five-square mile area that was annexed. Based on communication with the Town Manager, the land use designation and zoning for the plant site will be changed to a Basic Manufacturing and Industrial Zone (I-3). As a result, the project will be compatible with the land use plans for the area. In addition, the Applicant has been working with the Town to ensure conformance between the site plan and the general plan amendment.

The land use study has been attached as Exhibit B-1 to provide additional information, and land use maps are included in Exhibit A.

#### **AIR QUALITY**

The project is located in an area that is classified as "attainment" or "unclassified" for all criteria pollutants. The Applicant is completing the application for Prevention of Significant Deterioration (PSD) and Operating permits as required by the Maricopa County Air Quality Division. The best available control technology will be used for the project to minimize emissions of nitrogen oxides, carbon monoxide, volatile organic compounds, sulfur dioxide, and fine particulate matter.

Preliminary modeling results indicate that the project would not cause or contribute to any exceedance of any National Ambient Air Quality Standard (NAAQS) or PSD increment. Results further indicate that the project would not contribute to air quality exceedances in the Phoenix Metropolitan ozone nonattainment area. Due to a distance of more than 100 kilometers from the site to Class I visual quality areas (as defined by the BLM), the project is not expected to have any adverse impact on Class I air quality-related values such as visibility, wildlife, or vegetation.

The Applicant has met with staff from the Air Quality Division of Maricopa County Environmental Services, to provide a briefing on the project and schedule, and coordinate on the air permit.

Further information on the best available control technology to be used, project emissions and preliminary modeling have been included as Exhibit B-2.

#### **GROUNDWATER ASSESSMENT**

The project site is not located in an Active Management Area as defined by the Arizona Department of Water Resources. However, due to the importance of groundwater resources, a Phase II Water Supply Report has been completed for the project (Exhibit J-5). The purpose of the study was to collect information on local groundwater quality and production potential of existing wells, and use the findings to develop a production wellfield design for the plant. In addition, the potential impacts of groundwater pumping on neighboring wells were modeled. The study concluded that predicted drawdowns will not interfere with the pumping capacity of neighboring wells; however, if any impacts to those wells occurred, it could be mitigated by routine operation and maintenance of the wellfield.

The results of previous studies had indicated that a sufficient supply of groundwater exists of suitable quality to meet the demands of the proposed plant for the projected 30-year life of the facility. There are three existing wells on the project property that have operated since the 1970s, when the land was developed for farming. The current pumping rate (with the land under agricultural use) is equivalent to the planned pumping rate for the power plant production wellfield, the difference being that the production wellfield will pump continuously instead of nine months per year.

The Applicant has met with the Aquifer Protection staff of the Arizona Department of Environmental Quality to provide a briefing on the project and schedule, and coordinate on the aquifer protection permit, if necessary.

#### **CULTURAL RESOURCES INVENTORY**

A records review and survey for cultural resources were conducted for the project area by Dames & Moore. Overall, the ground disturbance associated with project construction does not appear to threaten any significant historical or archaeological properties. Potential impacts to the proposed Gatlin Site Cultural Park to the north and west of the site relate to noise and visual resources, and are discussed below and in Exhibit E. A summary discussion of historic sites and structures and archaeological sites is included in Exhibit E, and the full Cultural Resource Survey report is attached to this application (Exhibit J-6).

#### **NOISE**

No noise ordinances or other noise related regulations exist for the project area. However, an Ambient Noise Measurement and Noise Impact Assessment Report were prepared for the project (Exhibit J-7). The study measured ambient noise conditions in the vicinity of the proposed site, modeled the additional noise that could be generated by the plant, and recommended mitigation measures. The closest receptors of noise impacts would be residents in two farmsteads that would be located within ½ mile of the project site. The additional noise would be discernible due to the limited existing development and associated low ambient noise levels. To mitigate these impacts, noise control technology would be used for the project and earth berming to the south and west of the plant would be created. Landscaping is also a measure to mitigate visual impacts of the plant, which are described in Exhibit E.

Resource studies also addressed biological resources and visual resources, which are described in Exhibits C, D, and E.

#### EXHIBIT B-1 LAND USE STUDY

#### INTRODUCTION

The land use study documents existing and future land uses and identifies potential impacts of the proposed project. Using these data, mitigation measures were developed to reduce potential impacts. This land use report consists of three subsections—inventory, impact assessment, and mitigation.

The project site is illustrated on Figures A-1 through A-4.

#### **Inventory**

The data compiled for the land use inventory were used to assess potential land use impacts that may result from the construction, operation, and maintenance of the proposed generation facility. The study area encompasses the land area within a 2-mile radius of the project site. The data inventoried include jurisdiction, land ownership, and existing and future land uses.

A base map was prepared using the U.S. Geological Survey's (USGS) *Gila Bend* (1973) and *Cotton Center* (1973) 1:24,000 scale series topographic maps. The information for the inventory was gathered through aerial photograph interpretation; field verification; review of existing maps and plans; and contacts with town, county, and state planning entities as well as private landowners. This information was mapped at a scale of 1:24,000 for use in the analysis.

#### **Study Components**

The land use inventory is divided into three major components to facilitate the impact analysis for the proposed project. The three study maps that illustrate the land use components are included in Exhibit A and are described below.

#### Land Ownership and Jurisdiction

The project site is located on privately owned land under the jurisdiction of the Town of Gila Bend. Outside of Gila Bend's jurisdictional boundaries, the land is unincorporated and therefore under the jurisdiction of Maricopa County. Tohono O'odham Nation land is found northwest of the site as well as in San Lucy Village on the eastern boundary of Section 25, to the southwest. The Bureau of Land Management and the Arizona State Land Department own land to the east and north of the site.

#### Existing Land Use

Currently, the project site is undeveloped. The majority of the study area consists of agricultural land and vacant desert land in addition to farmsteads and associated residences. Larger clusters of development in the vicinity include the Town of Gila Bend and the San Lucy Village District of the Tohono O'odham Nation, which occupy the southern portion of the study area. The Town of Gila Bend contains residential, commercial, public/quasi-public, and industrial land uses, as well as school/educational facilities and parks. A description of the specific types of land uses and their general locations within the study area boundary are provided below.

Residential - Residential land uses include primarily single-family dwelling units and mobile homes. The majority of residences occur in the San Lucy Village (approximately 1.5 miles) and the Town of Gila Bend (approximately 2 miles). The closest residences are the two farmsteads located approximately ½ mile to the south of the project site. Within 1 mile of the site, there are an additional 3 farmsteads and 19 scattered residences.

*Parks* - The two parks in the study area are located in the Town of Gila Bend (approximately 2 miles). One park is located south of the school on Papago Street. The other park is adjacent to the north side of the school and includes athletic fields and facilities.

Commercial - Commercial land uses within the study area occur to the south of the project site in the Town of Gila Bend. They are concentrated in the center of Town along Pima Street. The San Lucy Village contains a small commercial area on San Lucy Road.

*Industrial* - Industrial land uses are located in the vicinity of the Town of Gila Bend (between 1.5 and 2 miles from the site) with the exception of a sewage lagoon approximately 1 mile northwest of the project site.

Public/Quasi-Public - The public/quasi-public land uses include municipal and state buildings, Gila Bend Municipal Airport, and local churches. The airport is located approximately 1.5 miles to the southwest of the project site along State Route 85.

School/Educational Facilities – The Gila Bend Elementary and High Schools are located in the study area within the Town of Gila Bend, approximately 2 miles southwest of the project site.

Agriculture - Irrigated farmland stretches across the central and northern portions of the study area. Primarily cotton and alfalfa are cultivated. The project site is bound by farmland to the north, west, and east.

Utilities – A network of electrical transmission lines is present in the vicinity of the project site. The Liberty-Gila Bend 230kV transmission line is located approximately 1 mile east of State Route 85 before turning west to parallel Watermelon Road. A 69kV/12kV transmission line also parallels Watermelon Road before following Old Highway 80 northward. Both of these lines are located less than ¼ mile south of the project site on Watermelon Road. Distribution lines connect

the 69kV/12kV system to residences in the area. A gas pipeline and fiber optic lines also utilize corridors along Watermelon Road and Old Highway 80.

Transportation – Major arterials within the study area often follow section lines and may be paved, improved, or dirt roads. Stout Road (299<sup>th</sup> Avenue) and Watermelon Road occur in the vicinity of the project site. Old Highway 80 traverses a corner of the Applicant's property, and State Route 85 to Phoenix is located approximately 1.5 miles to the east. In addition, Interstate 8 passes 3 miles south of the proposed project site.

Vacant Land – Land east of State Route 85 and north of the airport within the study area is vacant. This land is characterized by a lack of development and desert scrub vegetation.

Other Land Uses – The Gila Bend Canal is a major feature in the vicinity of the project site, and is located to the east of the site and Old Highway 80.

#### Future Land Use

The majority of the study area, including the project site, lies on rural undeveloped or agricultural land within the Town of Gila Bend. The land currently is included in the Town's Rural Zone, which includes residential, recreational, and agricultural uses. The Town of Gila Bend has initiated a general plan amendment that would change the land use designation for an area that includes the project site to a Basic Manufacturing and Industrial Zone.

The northern portion of the study area contains land designated in the Maricopa County Comprehensive Plan as Privately Owned Proposed Open Space (Maricopa County 1997). This area appears to correspond with the Gila River and is located approximately 1.5 miles to the northwest from the site. The remainder of the unincorporated area falls within Maricopa County's Rural Development Area.

The Town of Gila Bend Master Plan Update (Town of Gila Bend 1996) shows no major changes to existing developed land in the Town of Gila Bend, but allows for the expansion of residential and park land uses north to Watermelon Road. Communication with the town manager of Gila Bend indicates that several developers of recreational vehicle parks have engaged the Town in preliminary discussions regarding plans for new recreational vehicle park developments within 1 mile of the project site; however, no plans have yet been submitted to the Town.

Land owned by the Town of Gila Bend (portions of Sections 18 and 19) includes the proposed Gatlin Site Cultural Park. Future plans for the Gatlin Site Cultural Park have been addressed in the *Inventory Survey and Interpretive and Stabilization Plans for the Gatlin Site National Landmark, Gila Bend, Arizona* (Estrella Cultural Research 1993). This area is known to contain archaeological and historic sites, and has been identified for a future park and interpretive site. The preliminary park plan illustrates a trail system to correspond with notable sites and parking facilities in the southern portion of the site that will be accessed via Stout Road. Funding has not been identified for this project, although the Town of Gila Bend is in the process of completing

an application for a Heritage Fund Grant that will be submitted in early 2000. No interpretive buildings have been identified for the future park.

The Gila Bend-Ajo 230kV transmission line has been approved; the route would run north from Ajo to the Gila Bend Substation, located near Interstate 8 west of the Town. The approved Gila Bend to Santa Rosa 230kV line proceeds south from the Gila Bend Substation before turning east following Maricopa Road. Several additional transmission lines have been proposed in the area, including two 500kV transmission lines that may parallel the existing Liberty-Gila Bend 230kV transmission line.

### **Impact Assessment**

Impacts to land use may be identified by the occurrence of a loss of or restrictions to an existing land use, or site incompatibility with existing land use plans. The proposed plant site is under private ownership, and is largely adjacent to agricultural and vacant lands. The site is currently undeveloped, and the proposed project would not conflict with existing uses or existing plans for future development. The project planned for this site would be compatible with the Gila Bend general plan amendment initiated by the Town of Gila Bend.

The unincorporated area surrounding the project site is designated for rural uses under the existing zoning. A records search at the county's Planning and Zoning Department indicated that no developments have been proposed or approved in the unincorporated portion of the study area.

Construction of the new facilities would involve the development of new access roads within the Applicant's property boundaries. The site may be accessed from Watermelon Road and Old Highway 80. The proximity of the site to Old Highway 80 and State Route 85, roads that are paved and can accommodate truck traffic away from the Town of Gila Bend, is a positive attribute of the site. It is not expected that the construction and use of these facilities would disrupt existing circulation patterns or restrict access to local properties.

### **Mitigation**

Although no substantial impacts to existing or future land uses are expected as a result of constructing and operating the proposed project, residences within a ½ mile of the project site and the proposed Gatlin Site Cultural Park may be subject to visual and noise impacts from the project that could be minimized by creating a landscaped buffer with planting and berming.

### REFERENCES

Bureau of Land Management. 1984. Surface Management and Mineral Management Status Map for Phoenix South.

\_\_\_\_\_. 1982. Surface Management and Mineral Management Status Map for Gila Bend.

Estrella Cultural Research. December 1993. Inventory Survey and Interpretive and Stabilization Plans for Gatlin Site National Landmark, Gila Bend, Arizona.

Gannett Fleming. May 1996. Gila Bend Municipal Airport Master Plan Update 1995-2015.

Gila Bend, Town of. 1996. Town of Gila Bend Master Plan Update.

Kenney Aerial Mapping, Gila Bend and Cotton Center Images, dated January 19, 1999 and May 19, 1999.

Maricopa Association of Governments. 1995. Desert Spaces: An Open Space Plan for the Maricopa Association of Governments.

Maricopa County. October 1997. Comprehensive Plan.

Southwestern Power Group, LLC. May 1999. Project Overview: Gila Bend Power Plant.

U.S. Geological Survey. 1973. Topographic quadrangle maps for Gila Bend and Cotton Center, Arizona.

## EXHIBIT B-2 AIR QUALITY

### **SUMMARY**

The project is planned for construction in Maricopa County, near the Town of Gila Bend. This is an area designated "attainment" or "unclassified" for all criteria pollutants. The project would be a Prevention of Significant Deterioration (PSD) major source of nitrogen oxides ( $NO_x$ ), carbon monoxide (CO), volatile organic compounds ( $VOC_s$ ), sulfur dioxide ( $SO_2$ ), and fine particulate matter ( $PM_{10}$ ). Best available control technology will be used to minimize emissions. Panda (Applicant) is currently completing the application for the project's PSD and Operating permits, which will be filed with the Maricopa County Air Quality Division (Division).

Preliminary modeling results indicate that the project would not cause or contribute to any exceedance of any National Ambient Air Quality Standard (NAAQS) or PSD increment. Results further indicate that the project would not contribute to ambient air quality exceedances in the Phoenix Metropolitan ozone nonattainment area. Due the distance of the project site from the nearest Class I area (more than 100 kilometers), the project is not expected to have any adverse impact on Class I air quality related values such as visibility, wildlife, or vegetation.

### PROJECT DESCRIPTION

At completion, the project would have a capacity of 2,080 megawatts (MW) and would include:

- eight combined-cycle combustion turbines
- eight duct burners
- four steam turbines
- four cooling towers

The combustion turbines would be natural gas-fired and rated at 170 MW (nominal). Each turbine would exhaust through a heat recovery steam generator (HRSG) equipped with a natural gas-fired duct burner. Exhaust from two HRSGs would be directed to a steam turbine.

### BEST AVAILABLE CONTROL TECHNOLOGY

The Applicant is required to install best available control technology (BACT) on the emitting units that would make up the project. Top-down BACT analyses will be included in the air quality permit application for the project. The combustion turbines are planned to be equipped with the best dry low oxides of nitrogen (DLN) technology available. The use of pipeline quality natural gas and good combustion practices will be used to minimize CO, VOCs,  $SO_2$ , and  $PM_{10}$  emissions. Drift eliminators will be used to reduce  $PM_{10}$  emissions from the cooling towers.

### PROJECT EMISSIONS

Project emissions result from the combustion turbines, the duct burners, and the cooling towers. Initial estimates of annual emissions from these sources have been made and the results are shown in Table B-2-1. These estimates include emissions expected from startups and shutdowns. Emissions from emergency equipment have not been included, but will be incorporated in the air permit application.

TABLE B-2-1 ESTIMATED ANNUAL EMISSIONS		
Estimated Annual Emission Pollutant (tons per year)		
NO <sub>x</sub>	2,448	
PM <sub>10</sub>	730	
SO <sub>2</sub>	93	
CO	1,784	
VOC	202	

### AIR QUALITY IMPACTS

The Applicant is currently in the process of developing a modeling protocol that would meet the approval of the Division. This protocol defines the various aspects of conducting the ambient air quality impact analyses that are a required part of the air permit application. A key input for modeling and point of agreement with the Division is the meteorological data. To be accepted by the Division, the meteorological data used for modeling must have been collected on the project site, or have been collected from a "representative" off-site location.

The Applicant and the Division are evaluating the availability of representative meteorological data. As a part of the University of Arizona Cooperative Extension meteorological network (AZMET), meteorological data are collected at the Paloma Ranch station, which is located approximately 12 miles west-southwest of the project location. The results presented herein are based on modeling with Paloma Ranch data.

The dispersion modeling analysis required for major sources subject to PSD review typically involves two distinct phases. The objective of the first phase is to perform initial dispersion modeling to assess whether the proposed project triggers the need for pre-construction ambient monitoring, and whether predicted impacts are expected to be "significant." Predicted impacts are considered significant, with respect to PSD, if they equal or exceed the significance levels defined in the PSD regulations. If no significant ambient impacts are predicted for a particular pollutant, no further analysis for that pollutant is required. If significant ambient impacts are predicted, then a cumulative impact analysis must be completed for that pollutant. This requires conducting a NAAQS analysis for the pollutant, in which other emission sources in the area are modeled, and conducting a PSD increment analysis for the pollutant, which incorporates emissions from other increment-consuming sources in the area.

Preliminary air quality impacts have been determined for the project, and are compared to the PSD significance levels, the pre-construction monitoring levels, the NAAQS (which are the same as the Maricopa County air quality standards), and the PSD Class II increments.

### **Preliminary Model Results**

Model predictions are based on the U.S. Environmental Protection Agency's Industrial Source Complex Model (ISCST3, version 99155). A polar receptor grid extending to 50 kilometers from the project location was established, and incorporates the terrain elevation for each receptor modeled. Receptors at approximately a 50-meter spacing also were modeled along the proposed property boundary. Impacts are based on the scenario of all eight combustion turbines operating simultaneously.

Preliminary model results indicate that the PSD significance levels are exceeded for  $NO_x$  and  $PM_{10}$ . Hence it is anticipated that the project would require NAAQS and PSD increment analyses for these pollutants. Table B-2-2 shows maximum predicted impacts compared to the PSD significance levels (note that the Maricopa County and federal significance levels are identical).

TABLE B-2-2 COMPARISON OF PRELIMINARY IMPACTS WITH THE PSD SIGNIFICANCE LEVELS					
Maximum Predicted Averaging Pollutant Period Predicted Pollutant Period Predicted Predicted Significance Significance Level (μg/m³) Level					
NO <sub>x</sub>	Annual	2.5	1.0	250	
$PM_{10}$	Annual	1.1	1.0	110	
PM <sub>10</sub>	24-hour	6.6	5.0	132	
SO <sub>2</sub>	Annual	0.1	1.0	10	
SO <sub>2</sub>	3-hour	3.5	25.0	14	
SO <sub>2</sub>	24-hour	0.7	5.0	14	
CO	1-hour	112.4	2000	6	
СО	8-hour	37.6	500	8	
	year of Paloma Rar ty Air Pollution Co		l data. II, Rule 240, Section 2	13	

Preliminary results indicate that pre-construction monitoring may not be required (note that the Maricopa County and federal pre-construction monitoring levels are identical). Table B-2-3 provides a comparison of predicted impacts with the pre-construction monitoring levels. There is potential, however, that in modeling additional years of meteorological data, as would likely be required for the air permit application, the 24-hour  $PM_{10}$  monitoring level may be exceeded.

# TABLE B-2-3 COMPARISON OF PRELIMINARY IMPACTS WITH MONITORING EXCEPTION LEVELS

Pollutant	Averaging Period	Maximum Predicted Impact <sup>a</sup> (µg/m³)	Monitoring Exception Level <sup>b</sup> _(μg/m³)
NO <sub>x</sub>	Annual	2.5	14.0
$PM_{10}$	24-hour	6.6	10.0
SO <sub>2</sub>	24-hour	0.7	13.0
CO	8-hour	37.6	575.0

<sup>a</sup>Based on 1996 year of Paloma Ranch meteorological data.

<sup>b</sup>Maricopa County Air Pollution Control, Regulation II, Rule 240, Section 507.1.

For the pollutants triggering the significance levels, predicted impacts were compared with the NAAQS and PSD increments, as shown in Tables B-2-4 and B-2-5, respectively. The preliminary results indicate compliance with both the NAAQS and PSD increments.

	TABLE B-2-4 COMPARISON OF PRELIMINARY IMPACTS WITH THE NAAQS					
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$				Percent of NAAQS		
NO <sub>x</sub>	Annual	2.5	17°	19.5	100.0	20
PM <sub>10</sub>	Annual	1.1	20 <sup>d</sup>	21.1	50.0	42
PM <sub>10</sub>	24-hour	6.6	60 <sup>d</sup>	66.6	150.0	44

<sup>&</sup>lt;sup>a</sup>Based on 1996 year of Paloma Ranch meteorological data.

<sup>&</sup>lt;sup>d</sup>Average of 1997 and 1998 data from Palo Verde monitoring site. Short-term is 2<sup>nd</sup> maximum reported value.

TABLE B-2-5 COMPARISON OF PRELIMINARY IMPACTS WITH CLASS II PSD INCREMENTS				
Maximum Predicted Class II PSD Averaging Impact <sup>a</sup> Increment Percent of Class II Pollutant Period (μg/m³) (μg/m³) PSD Increment				
NO <sub>x</sub>	Annual	2.5	25.0	10
PM <sub>10</sub>	Annual	1.1	17.0	6
$PM_{10}$	24-hour	6.6	30.0	22

Background concentrations from monitored air quality data are used in the NAAQS analysis to represent existing air quality. These concentrations are added to the model predictions to assess compliance with the relevant standards. Monitoring data for this analysis were obtained from the

<sup>&</sup>lt;sup>b</sup>Same as Maricopa County Air Quality Standards.

<sup>°1998</sup> maximum 24-hour average from Palo Verde monitoring site.

Arizona Department of Environmental Quality (ADEQ), upon consultation with the Division. The closest monitoring site for  $NO_x$  and  $PM_{10}$  is the ADEQ monitoring site near Palo Verde (approximately 70 miles to the north-northwest of the project site).

Based on past quality control/quality assurance procedures, previously reported annual  $NO_x$  data are not considered completely reliable (personal communication with ADEQ personnel). Consequently, the maximum 24-hour monitored  $NO_x$  data were selected. Further evaluation of the monitoring data is required to determine how much it reflects "background" air quality, and how much it reflects the influence of other emission sources in the area (to avoid double-counting, monitoring data used in a modeling analysis should not be influenced by sources that are also discretely modeled).

The NAAQS and PSD increment emission inventories for the project are currently being developed, but are not expected to be extensive. Based on information received at the project pre-application meeting with the Division on 10 December 1999, the two highest emitting sources to account for in the NAAQS analysis are the Palo Verde Nuclear Generating Station and El Paso Natural Gas. Given the distance alone between these sources and the project site, no significant cumulative interaction between these facilities and the project sources is anticipated.

### **Air Quality Related Values**

The project site is located more than 100 kilometers from the nearest, federal Class I area. Based on the pre-application meeting with the Division, no Class I area impact analysis is required, in light of this fact.

# EXHIBIT C AREAS OF BIOLOGICAL WEALTH

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Describe any areas in the vicinity of the proposed site or route which are unique because of biological wealth or because they are habitats for rare and endangered species. Describe the biological wealth or species involved and state effects, if any, the proposed facilities will have thereon."

### **BIOLOGICAL WEALTH**

Landscapes in the vicinity of the Panda Gila River Project site are dominated by agricultural lands and native Sonoran desert vegetation. The power plant will be placed in an area of primarily native vegetation (see Figure 2).

Native vegetation in the site vicinity is representative of the Lower Colorado River Valley Subdivision of Sonoran desertscrub (Turner and Brown 1994). The native vegetation can be separated into two distinct environments. Flatlands are dominated by creosote bush (*Larrea tridentata*) with scattered honey mesquite (*Prosopis glandulosa*) and rayless encelia (*Encelia frutescens*). Washes support a more diverse plant community including blue paloverde (*Cercidium floridum*), ironwood (*Olneya tesota*), burro brush (*Hymenoclea sp.*), canyon ragweed (*Ambrosia ambrosoides*), and tamarisk (*Tamarix spp.*).

Special status wildlife and plant species that potentially occur within the site vicinity are listed in Table C-1. These include species listed as endangered or threatened under the Endangered Species Act and wildlife of special concern identified by the Arizona Game and Fish Department (AGFD). Letters from the U.S. Fish and Wildlife Service and AGFD that provide information on special status species that may occur in the site vicinity are attached. Of the species listed in Table C-1, California leaf-nosed bats, lesser long-nosed bats, great egrets, snowy egrets, cactus ferruginous pygmy-owls, belted kingfishers, and Sonoran desert tortoise have at least some potential to occur on the site.

Threats to California leaf-nosed bats include vandalism at roost sites and a general lack of suitable winter roost sites. This species of bat roosts in caves and mine shafts. No caves or mine shafts are present on the site. Desert scrub vegetation at the site may provide foraging habitat for the California leaf-nosed bat.

Lesser long-nosed bats roost in caves and mine shafts and forage at columnar cacti and agave flowers. The site vicinity is unlikely to provide foraging habitat for lesser long-nosed bats due to the limited presence of saguaros and the lack of agaves. No potential roost sites were present on the site.

Great and snowy egrets may be present along the Gila Bend Canal east of the proposed facility where they forage along the water edge. These species may utilize evaporation ponds if constructed at the site. Breeding by these egrets is restricted to areas along the Colorado River and is not expected in the vicinity of the proposed facility (Witzeman et al. 1997).

Native vegetation along washes in the vicinity of the proposed power plant is potential habitat for the endangered cactus ferruginous pygmy-owl. The habitat quality on the site is low because the habitat along the washes is discontinuous and potential nest cavities, which are predominantly in saguaros, are rare.

Belted kingfishers may forage along the Gila Bend Canal east of the proposed facility during the winter. This species is not expected to breed in the vicinity of the proposed facility.

Sonoran desert tortoise may be present in low numbers along the banks of the washes and along the Gila River. These areas are marginal habitat for the tortoise due to the relatively low elevation and lack of rocky terrain.

#### POTENTIAL EFFECTS

Disturbance during construction and from plant operations is not expected to adversely affect special-status species, although disturbance from construction activities may result in temporary disturbances in the site vicinity. The potential for cactus ferruginous pygmy owls is low, but a survey could be conducted in potential habitat within 1,500 feet of the site location prior to construction. The Arizona Department of Agriculture would be notified regarding removal of plants protected by the Arizona Native Plant Law, such as mesquites, paloverdes, and saguaros.

TABLE C-1 SPECIAL STATUS WILDLIFE AND PLANT SPECIES THAT POTENTIALLY OCCUR IN THE VICINITY OF THE PANDA GILA RIVER PROJECT				
Common Name	Scientific Name	Habitat Type	Federal Status	State Status
California leaf- nosed bat	Macrotus californicus	forages in desert scrub habitats	none	wildlife of concern
Lesser long- nosed bat	Leptonycteris curasoae yerbabuenae	desert scrub with agave and columnar cacti	endangered	wildlife of concern
Great egret	Ardea alba	ponds, streams, and marshes	none	wildlife of concern
Snowy egret	Egretta thula	ponds, streams, and marshes	none	wildlife of concern
Belted kingfisher	Ceryle alcyon	pond, streams, and canals	none	wildlife of concern
Cactus ferruginous pygmy-owl	Glaucidium brasilianum cactorum	mature cottonwood/willow, mesquite bosques, and Sonoran desertscrub	endangered	wildlife of concern
Sonoran desert tortoise	Gopherus agassizii	rocky foothills, lower bajadas, and semidesert grassland	none	wildlife of concern

### REFERENCES

- Dames & Moore. 1994. PacifiCorp Turbine Pipeline Project, A Biological Resources Survey.
- Monson, G. and A.R. Phillips. 1981. Annotated checklist of the birds of Arizona. University of Arizona Press, Tucson, Arizona.
- Turner, R.M. and D.E. Brown. 1994. Sonoran Desertscrub. Pages 180-222 In D.E. Brown, editor. Biotic Communities: Southwestern United States and Northwestern Mexico.
- Wirth Associates. 1980. APS/SDG&E Interconnection Project Transmission System Environmental Study, Phase II Corridor Studies. Volume I.
- Witzeman, J., S. Demaree, and E. Radke. 1997. Birds of Phoenix and Maricopa County, Arizona. Maricopa Audubon society, Phoenix, Arizona.

Governor Jane Dee Hull

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# **GAME & FISH DEPARTMENT**

2221 West Greenway Road, Phoenix, Arizona 85023-4399 (602) 942-3000 www.gf.state.az.us

November 10, 1999

Ms. Danielle Stearns
Dames & Moore
1790 East River Road, Suite E-300
Tucson, Arizona 85718-5876

Re:

Special Status Species; Proposed Power Plant near Gila Bend, Arizona - Township 5 South, Range 4 West, Sections 8, 17, 20, 21, 28

Dear Ms. Stearns:

The Arizona Game and Fish Department (Department) has received your letter, dated October 14, 1999, regarding special status species in the above-referenced area, and the following information is provided.

The Department's Heritage Data Management System has been accessed and current records do not indicate the presence of any Endangered, Threatened or other special status species in the project vicinity. In addition, there is no designated or proposed Critical Habitat in the project area.

At this time, the Department's comments are limited to the special status species information provided above. This correspondence does not represent the Department's evaluation of impacts to wildlife or wildlife habitat associated with activities occurring in the subject area. If you have any questions regarding this letter, please contact me at (602) 789-3606.

Sincerely,

Nancy Olson

Project Evaluation Specialist

Many Olson

Habitat Branch

NLO:no

cc: Russ Engel, Habitat Program Manager, Region IV, Yuma

AGFD# 10-18-99(09)



# United States Department of the Interior

## U.S. Fish and Wildlife Service

2321 W. Royal Palm Road, Suite 103 Phoenix, Arizona 85021-4951 (602)640-2720 FAX (602)640-2730



In Reply Refer To: AESO/SE 2-21-00-I-010

October 21, 1999

Ms. Danielle Stearns
Dames & Moore
Cambric Corporate Center
1790 East River Road, Suite E-300
Tucson, Arizona 85718-5876

RE: Panda Gila River Generation Project (D&M Project No. 28982-019-9050)

Dear Ms. Stearns:

This letter responds to your October 14, 1999, request for an inventory of threatened or endangered species, or those that are proposed to be listed as such under the Endangered Species Act of 1973, as amended (Act), which may potentially occur in your project area (Maricopa County). The enclosed list may include candidate species as well. We hope the enclosed county list of species will be helpful. In future communications regarding this project, please refer to consultation number 2-21-00-I-010.

The enclosed list of the endangered, threatened, proposed, and candidate species includes all those potentially occurring anywhere in the county, or counties, where your project occurs. Please note that your project area may not necessarily include all or any of these species. The information provided includes general descriptions, habitat requirements, and other information for each species on the list. Also on the enclosed list is the Code of Federal Regulations (CFR) citation for each list and is available at most public libraries. This information should assist you in determining which species may or may not occur within your project area. Site-specific surveys could also be helpful and may be needed to verify the presence or absence of a species or its habitat as required for the evaluation of proposed project-related impacts.

Endangered and threatened species are protected by Federal law and must be considered prior to project development. If the action agency determines that listed species or critical habitat may be adversely affected by a federally funded, permitted, or authorized activity, the action agency must request formal consultation with the Service. If the action agency determines that the planned action may jeopardize a proposed species or destroy or adversely modify proposed critical habitat, the action agency must enter into a section 7 conference with the Service. Candidate species are those which are being considered for addition to the list of threatened or endangered species. Candidate species are those for which there is sufficient information to support a

proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event that they become listed or proposed for listing prior to project completion.

If any proposed action occurs in or near areas with trees and shrubs growing along watercourses, known as riparian habitat, the Service recommends the protection of these areas. Riparian areas are critical to biological community diversity and provide linear corridors important to migratory species. In addition, if the project will result in the deposition of dredged or fill materials into waterways or excavation in waterways, we recommend you contact the Army Corps of Engineers which regulates these activities under Section 404 of the Clean Water Act.

The State of Arizona protects some plant and animal species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department and the Arizona Department of Agriculture for State-listed or sensitive species in your project area.

The Service appreciates your efforts to identify and avoid impacts to listed and sensitive species in your project area. If we may be of further assistance, please feel free to contact Tom Gatz.

Sincerely,

David L. Harlow
Field Supervisor

Enclosure

cc: Director, Arizona Game and Fish Department, Phoenix, AZ

### LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: 08/26/1999

### 1) LISTED

**TOTAL= 13** 

NAME: ARIZONA AGAVE

AGAVE ARIZONICA

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: No CFR: 49 FR 21055. 05-18-1984

DESCRIPTION: HAS ATTRACTIVE ROSETTES OF BRIGHT GREEN LEAVES WITH DARK

MAHOGANY MARGINS. FLOWER: BORNE ON SUB-UMBELLATE

INFLORESCENCES.

**ELEVATION** 

RANGE: 3000-6000 FT.

COUNTIES: GILA, YAVAPAI, MARICOPA

HABITAT: TRANSITION ZONE BETWEEN OAK-JUNIPER WOODLAND & MOUNTAIN MAHOGANY-OAK SCRUB

SCATTERED CLONES IN NEW RIVER MOUNTAINS AND SIERRA ANCHA. USUALLY FOUND ON STEEP, ROCKY SLOPES, POSSIBLY MAZATAL MOUNTAINS. SHOULD BE LOOKED FOR WHEREVER THE RANGES OF Agave tournevana var. bella AND Agave chrystantha OVERLAP.

NAME: ARIZONA CLIFFROSE

PURSHIA SUBINTEGRA

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 49 FR 22326 5-29-84

DESCRIPTION: EVERGREEN SHRUB OF THE ROSE FAMILY (ROSEACEAE). BARK PALE

SHREDDY. YOUNG TWIGS WITH DENSE HAIRS, LEAVES 1-5 LOBES AND

EDGES CURL DOWNWARD (REVOLUTE). FLOWERS: 5 WHITE OR YELLOW ELEVATION

PETALS < 0.5 INCH LONG.

RANGE: <4000

FT.

COUNTIES: GRAHAM YAVAPAI MARICOPA MOHAVE

HABITAT: CHARACTERISTIC WHITE SOILS OF TERTIARY LIMESTONE LAKEBED DEPOSITS.

WHITE SOILS OF TERITIARY LIMESTONE LAKEBED DEPOSITS CAN BE SEEN FROM A DISTANCE.

NAME: ARIZONA HEDGEHOG CACTUS

ECHINOCEREUS TRIGLOCHIDIATUS ARIZONICUS

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: No CFR: 44 FR 61556,10-15-1979

DESCRIPTION: DARK GREEN CYLINDROID 2.5-12 INCHES TALL, 2-10 INCHES IN

DIAMETER, SINGLE OR IN CLUSTERS, 1-3 GRAY OR PINKISH CENTRAL

SPINES LARGEST DEFLEXED AND 5-11 SHORTER RADIAL SPINES.

ELEVATION RANGE: 3700-5200 FT.

FLOWER: BRILLIANT RED, SIDE OF STEM IN APRIL- MAY

COUNTIES: MARICOPA, GILA, PINAL

HABITAT: ECOTONE BETWEEN INTERIOR CHAPPARAL AND MADREAN EVERGREEN WOODLAND

OPEN SLOPES, IN NARROW CRACKS BETWEEN BOULDERS, AND IN UNDERSTORY OF SHRUBS. THIS VARIETY IS BELIEVED TO INTERGRADE AT THE EDGES OF ITS DISTRIBUTION WITH VARIETIES MELANCANTHUS AND NEOMEXICANUS CAUSING SOME CONFUSION IN IDENTIFICATION.

#### **MARICOPA**

### LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: 08/26/1999

NAME: LESSER LONG-NOSED BAT

LEPTONYCTERIS CURASOAE YERBABUENAE

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 53 FR 38456, 09-30-88

DESCRIPTION: ELONGATED MUZZLE, SMALL LEAF NOSE, AND LONG TONGUE.

YELLOWISH BROWN OR GRAY ABOVE AND CINNAMON BROWN BELOW.

TAIL MINUTE AND APPEARS TO BE LACKING, EASILY DISTURBED.

ELEVATION

RANGE: <6000 FT

COUNTIES: COCHISE, PIMA, SANTA CRUZ, GRAHAM, PINAL, MARICOPA

HABITAT: DESERT SCRUB HABITAT WITH AGAVE AND COLUMMNAR CACTI PRESENT AS FOOD PLANTS

DAY ROOSTS IN CAVES AND ABANDONED TUNNELS, FORAGES AT NIGHT ON NECTAR, POLLEN, AND FRUIT OF PANICULATE AGAVES AND COLUMNAR CACTI. THIS SPECIES IS MIGRATORY AND IS PRESENT IN ARIZONA. USUALLY FROM APRIL TO SEPTMBER AND SOUTH OF THE BORDER THE REMAINDER OF THE YEAR.

NAME: SONORAN PRONGHORN

ANTILOCAPRA AMERICANA SONORIENSIS

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67

DESCRIPTION: BUFF ON BACK AND WHITE BELOW, HOOFED WITH SLIGHTLY CURVED

BLACK HORNS HAVING A SINGLE PRONG. SMALLEST AND PALEST OF

THE PRONGHORN SUBSPECIES.

**ELEVATION** 

RANGE: 2000-4000 FT.

COUNTIES: PIMA, YUMA, MARICOPA

HABITAT: BROAD, INTERMOUNTAIN ALLUVIAL VALLEYS WITH CREOSOTE-BURSAGE & PALO VERDE-MIXED CACTI **ASSOCIATIONS** 

TYPICALLY, BAJADAS ARE USED AS FAWNING AREAS AND SANDY DUNE AREAS PROVIDE FOOD SEASONALLY. HISTORIC RANGE WAS PROBABLY LARGER THAN EXISTS TODAY. THIS SUBSPECIES ALSO OCCURS IN MEXICO.

NAME: DESERT PUPFISH

CYPRINODON MACULARIUS

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 51 FR 10842, 03-31-1986

DESCRIPTION: SMALL (2 INCHES) SMOOTHLY ROUNDED BODY SHAPE WITH NARROW

VERTICAL BARS ON THE SIDES, BREEDING MALES BLUE ON HEAD AND

SIDES WITH YELLOW ON TAIL. FEMALES & JUVENILES TAN TO OLIVE

COLORED BACK AND SILVERY SIDES.

**ELEVATION** 

RANGE: <5000 FT.

COUNTIES: LA PAZ, PIMA, GRAHAM, MARICOPA, PINAL, YAVAPAI, SANTA CRUZ

HABITAT: SHALLOW SPRINGS, SMALL STREAMS, AND MARSHES. TOLERATES SALINE & WARM WATER

CRITICAL HABITAT INCLUDES QUITOBAQUITO SPRING, PIMA COUNTY, PORTIONS OF SAN FELIPE CREEK, CARRIZO WASH, AND FISH CREEK WASH, IMPERIAL COUNTY, CALIFORNIA. TWO SUBSPECIES ARE RECOGNIZED: DESERT PUPFISH (C. m. macularis) AND QUITOBAQUITO PUPFISH (C. m. eremus).

#### MARICOPA

### LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: 08/26/1999

NAME: GILA TOPMINNOW

POECILIOPSIS OCCIDENTALIS OCCIDENTALIS

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-1967

DESCRIPTION: SMALL (2 INCHES), GUPPY-LIKE, LIVE BEARING, LACKS DARK SPOTS ON

ITS FINS, BREEDING MALES ARE JET BLACK WITH YELLOW FINS.

ELEVATION

RANGE: <4500 FT.

COUNTIES: GILA, PINAL, GRAHAM, YAVAPAI, SANTA CRUZ, PIMA, MARICOPA, LA PAZ

HABITAT: SMALL STREAMS, SPRINGS, AND CIENEGAS VEGETATED SHALLOWS

SPECIES HISTORICALLY OCCURRED IN BACKWATERS OF LARGE RIVERS BUT IS CURRENTLY ISOLATED TO SMALL STREAMS AND SPRINGS

NAME: RAZORBACK SUCKER

XYRAUCHEN TEXANUS

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 55 FR 21154, 05-22-1990;

DESCRIPTION: LARGE (UP TO 3 FEET AND UP TO 16 POUNDS) LONG, HIGH SHARP-

59 FR 13374, 03-21-1994

EDGED KEEL-LIKE HUMP BEHIND THE HEAD. HEAD FLATTENED ON TOP.

OLIVE-BROWN ABOVE TO YELLOWISH BELOW.

ELEVATION

<6000 FT

RANGE:

COUNTIES; GREENLEE, MOHAVE, PINAL, YAVAPAI, YUMA, LA PAZ, MARICOPA (REFUGIA), GILA, COCONINO, GRAHAM HABITAT: RIVERINE & LACUSTRINE AREAS, GENERALLY NOT IN FAST MOVING WATER AND MAY USE BACKWATERS

SPECIES IS ALSO FOUND IN HORSESHOE RESERVOIR (MARICOPA COUNTY), CRITICAL HABITAT INCLUDES THE 100-YEAR FLOODPLAIN OF THE RIVER THROUGH GRAND CANYON FROM CONFLUENCE WITH PARIA RIVER TO HOOVER DAM; HOOVER DAM TO DAVIS DAM; PARKER DAM TO IMPERIAL DAM. ALSO GILA RIVER FROM AZ/NM BORDER TO COOLIDGE DAM: AND SALT RIVER FROM HWY 60/SR 77 BRIDGE TO ROOSEVELT DAM: VERDE RIVER FROM FS BOUNDARY TO HORSESHOE LAKE.

NAME: BALD EAGLE

HALIAEETUS LEUCOCEPHALUS

STATUS: THREATENED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 60 FR 35999, 07-12-95

DESCRIPTION: LARGE, ADULTS HAVE WHITE HEAD AND TAIL. HEIGHT 28 - 38";

WINGSPAN 66 - 96". 1-4 YRS DARK WITH VARYING DEGREES OF

MOTTLED BROWN PLUMAGE. FEET BARE OF FEATHERS.

**ELEVATION** 

RANGE: VARIES FΤ

COUNTIES: YUMA, LA PAZ, MOHAVE, YAVAPAI, MARICOPA, PINAL, COCONINO, NAVAJO, APACHE, SANTA CRUZ, PIMA, GILA, GRAHAM, COCHISE

HABITAT: LARGE TREES OR CLIFFS NEAR WATER (RESERVOIRS, RIVERS AND STREAMS) WITH ABUNDANT PREY

SOME BIRDS ARE NESTING RESIDENTS WHILE A LARGER NUMBER WINTERS ALONG RIVERS AND RESERVOIRS. AN ESTIMATED 200 TO 300 BIRDS WINTER IN ARIZONA. ONCE ENDANGERED (32 FR 4001, 03-11-1967; 43 FR 6233, 02-14-78) BECAUSE OF REPRODUCTIVE FAILURES FROM PESTICIDE POISONING AND LOSS OF HABITAT, THIS SPECIES WAS DOWN LISTED TO THREATENED ON AUGUST 11, 1995. ILLEGAL SHOOTING, DISTURBANCE, LOSS OF HABITAT CONTINUES TO BE A PROBLEM. SPECIES HAS BEEN PROPOSED FOR DELISTING (64 FR 36454) BUT STILL RECEIVES FULL PROTECTION UNDER ESA.

# LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: 08/26/1999

NAME: CACTUS FERRUGINOUS PYGMY-OWL

GLAUCIDIUM BRASILIANUM CACTORUM

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: No CFR: 62 FR 10730, 3-10-97

DESCRIPTION: SMALL (APPROX. 7"), DIURNAL OWL REDDISH BROWN OVERALL WITH

CREAM-COLORED BELLY STREAKED WITH REDDISH BROWN. SOME

INDIVIDUALS ARE GRAYISH BROWN

ELEVATION

RANGE: <4000 FT.

COUNTIES: MARICOPA, YUMA, SANTA CRUZ, GRAHAM, GREENLEE, PIMA, PINAL, GILA, COCHISE

HABITAT: MATURE COTTONWOOD/WILLOW, MESQUITE BOSQUES, AND SONORAN DESERTSCRUB

RANGE LIMIT IN ARIZONA IS FROM NEW RIVER (NORTH) TO GILA BOX (EAST) TO CABEZA PRIETA MOUNTAINS (WEST). ONLY A FEW DOCUMENTED SITES WHERE THIS SPECIES PERSISTS ARE KNOWN, ADDITIONAL SURVEYS ARE NEEDED. CRITICAL HABITAT IN PIMA, COCHISE, PINAL, AND MARICOPA COUNTIES (64 FR 37419).

NAME: MEXICAN SPOTTED OWL

STRIX OCCIDENTALIS LUCIDA

STATUS: THREATENED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 56 FR 14678, 04-11-91

DESCRIPTION: MEDIUM SIZED WITH DARK EYES AND NO EAR TUFTS. BROWNISH AND

HEAVILY SPOTTED WITH WHITE OR BEIGE.

ELEVATION

RANGE: 4100-9000 FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE, YAVAPAI, GRAHAM, GREENLEE, COCHISE, SANTA CRUZ, PIMA,

PINAL, GILA, MARICOPA

HABITAT: NESTS IN CANYONS AND DENSE FORESTS WITH MULTI-LAYERED FOLIAGE STRUCTURE

GENERALLY NESTS IN OLDER FORESTS OF MIXED CONIFER OR PONDERSA PINE/GAMBEL OAK TYPE, IN CANYONS, AND USE VARIETY OF HABITATS FOR FORAGING. SITES WITH COOL MICROCLIMATES APPEAR TO BE OF IMPORTANCE OR ARE PREFERED.

NAME: SOUTHWESTERN WILLOW FLYCATCHER

EMPIDONAX TRAILLII EXTIMUS

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: No CFR: 60 FR 10694, 02-27-95

DESCRIPTION: SMALL PASSERINE (ABOUT 6") GRAYISH-GREEN BACK AND WINGS,

WHITISH THROAT, LIGHT OLIVE-GRAY BREAST AND PALE YELLOWISH

BELLY, TWO WINGBARS VISIBLE, EYE-RING FAINT OR ABSENT.

ELEVATION

RANGE: <8500 FT.

COUNTIES: YAVAPAI, GILA, MARICOPA, MOHAVE, COCONINO, NAVAJO, APACHE, PINAL, LA PAZ, GREENLEE, GRAHAM, YUMA, PIMA, COCHISE, SANTA CRUZ

HABITAT: COTTONWOODWILLOW & TAMARISK VEGETATION COMMUNITIES ALONG RIVERS & STREAMS

MIGRATORY RIPARIAN OBLIGATE SPECIES THAT OCCUPIES BREEDING HABITAT FROM LATE APRIL TO SEPTEMBER. DISTRIBUTION WITHIN ITS RANGE IS RESTRICTED TO RIPARIAN CORRIDORS. DIFFICULT TO DISTINGUISH FROM OTHER MEMBERS OF THE EMPIDONAX COMPLEX BY SIGHT ALONE. TRAINING SEMINAR REQUIRED FOR THOSE CONDUCTING FLYCATCHER SURVEYS. CRITICAL HABITAT ON PORTIONS OF THE 100-YEAR FLOODPLAIN ON SAN PEDRO AND VERDE RIVERS; WET BEAVER AND WEST CLEAR CREEKS, INCLUDING TAVASCI MARSH AND ISTER FLAT; THE COLORADO RIVER, THE LITTLE COLORADO RIVER, AND THE WEST, EAST, AND SOUTH FORKS OF THE LITTLE COLORADO RIVER, REFERÊNCE 60 CFR:62 FR 39129, 7/22/97.

**MARICOPA** 

### LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:

08/26/1999

NAME: YUMA CLAPPER RAIL

RALLUS LONGIROSTRIS YUMANENSIS

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67; 48

DESCRIPTION: WATER BIRD WITH LONG LEGS AND SHORT TAIL. LONG SLENDER

FR 34182, 07-27-83

DECURVED BILL. MOTTLED BROWN ON GRAY ON ITS RUMP. FLANKS

AND UNDERSIDES ARE DARK GRAY WITH NARROW VERTICAL STRIPES ELEVATION

PRODUCING A BARRING EFFECT.

RANGE: <4500 FT.

COUNTIES: YUMA, LA PAZ, MARICOPA, PINAL, MOHAVE

HABITAT: FRESH WATER AND BRACKISH MARSHES

SPECIES IS ASSOCIATED WITH DENSE EMERGENT RIPARIAN VEGETATION. REQUIRES WET SUBSTRATE (MUDFLAT, SANDBAR) WITH DENSE HERBACEOUS OR WOODY VEGETATION FOR NESTING AND FORAGING. CHANNELIZATION AND MARSH DEVELOPMENT ARE PRIMARY SOURCES OF HABITAT LOSS.

# EXHIBIT D BIOLOGICAL RESOURCES

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"List the fish, wildlife, plant life and associated forms of life associated with the vicinity of the proposed sites or route and describe the effects, if any, other proposed facilities will have thereon."

### BIOLOGICAL RESOURCES

Lists of plants, mammals, birds, and reptiles and amphibians that may occur in the vicinity of the project area are presented in Tables D-1, D-2, D-3, and D-4, respectively.

### POTENTIAL EFFECTS

The project will be constructed in an area that is currently dominated by agricultural land and native vegetation. The native vegetation is characterized as Lower Colorado River Subdivision of Sonoran Desert Biome. This plant community is extensive in southern Arizona. Removal of the relatively small amount of native vegetation at the site would not harm this vegetation community as a whole.

Construction of the proposed facility may result in incidental mortality of small mammals and reptiles in the construction area. Disturbance during construction may temporarily interrupt foraging and breeding activities of animals in proximity to construction activities. Presence of the facility would result in increased disturbance due to the noise and traffic associated with daily operations.

If required and constructed at the Panda Gila River Project site, an evaporation pond would provide habitat for a variety of waterbirds such as herons, ducks, and shorebirds. Waterbirds would be attracted to the ponds by standing water and by food items such as brine shrimp that may become established in the ponds. The pond could provide a place where transient, migratory, or wintering waterbirds could feed and rest.

Concerns have been noted regarding the potential for harm to waterbirds at other evaporation ponds. Because many factors contribute to these effects, such as the water chemistry in the ponds and whether or not brine shrimp become established, it is possible that there would be no negative effects associated with waterbird use of the ponds (Tanner et al. 1999). One study was conducted in response to waterbird mortalities at an electric generating plant in Arizona. The waterbirds' ingestion of contaminated brine shrimp living in the plant's evaporation ponds was investigated, although no correlation between bird mortalities and the birds' use of the ponds was found. If an evaporation pond is constructed at the Panda Gila River Project site, the Applicant will review new studies on impacts to wildlife associated with evaporation ponds and, if

Application for Certificate of Environmental Compatibility

warranted, work with the Arizona Game and Fish Department to identify practical measures to avoid causing harm to waterbirds.

TABLE D-1 PLANT SPECIES OBSERVED IN THE VICINITY OF THE PANDA GILA RIVER PROJECT		
Common Name Scientific Name		
	Trees	
Western Honey Mesquite	Prosopis glandulosa var. torreyana	
Ironwood	Olneya tesota	
Blue Paloverde	Cercidium floridum	
Foothill Paloverde	Cercidium microphyllum	
Tamarisk	Tamarix ramosissima	
Catclaw Acacia	Acacia greggii	
Crucifixion Thorn	Castela emoryi	
	Shrubs	
Creosote Bush	Larrea tridentata	
Jimmy Weed	Isocoma heterophylla	
Rayless Encelia	Encelia frutescens	
Canyon Ragweed	Ambrosia ambrosioides	
Triangle-leaf Bursage	Ambrosia deltoidea	
White Bursage	Ambrosia dumosa	
Burrobush	Hymenoclea sp.	
Desert Saltbush	Atriplex polycarpa	
Desert Thorn/Wolfberry	Lycium sp.	
Catclaw Acacia	Acacia greggii	
	Grasses and Forbs	
Mediterranean Grass	Schismus barbatus	
Russian Thistle	Salsola iberica	
Tidestromia	Tidestromia oblongifolia	
Sand Pepper Grass	Lepidium lasiocarpum	
Wooly Plantain	Plantago insularis	
Red Spiny Herb	Chorizanthe spinosa	
Heron's Bill	Erodium cicutarium	
Spurge	Euphorbia spp.	
Wild Buckwheat	Eriogonum sp.	
Black Mustard	Brassica nigra	
Rambling Milkweed	Sarcostemma hirtellum	
Salt Heliotrope	Heliotropium curassavicum	
	Cacti	
Saguaro	Carnegiea gigantea	

# TABLE D-2 MAMMAL SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PANDA GILA RIVER PROJECT

Common Name	Scientific Name
Desert Shrew	Notiosorex crawfordi
California Leaf-nosed Bat	Macrotus californicus
Yuma Myotis	Myotis yumanensis
Cave Myotis	Myotis velifer
California Myotis	Myotis californicus
Western Pipistrelle	Pipistrellus hesperus
Big Brown Bat	Eptesicus fuscus
Southern Yellow Bat	Lasiurus ega
Townsend's Big-eared Bat	Plecotus townsendii
Pallid Bat	Antrozous pallidus
American Free-tailed Bat	Tadarida brasiliensis
Pocketed Free-tailed Bat	Tadarida femorosacca
Big Free-tailed Bat	Tadarida macrotis
Western Mastiff Bat	Eumops perotis
Desert Cottontail	Sylvilagus audobonii
Black-tailed Jack Rabbit	Lepus californicus
Harris' Antelope Squirrel	Ammospermophilus harrisii
Rock Squirrel	Spermophilus variegatus
Round-tailed Ground Squirrel	Spermophilus tereticaudus
Botta's Pocket Gopher	Thomomys bottae
Little Pocket Mouse	Perognathus longimembris
Arizona Pocket Mouse	Perognathus amplus
Rock Pocket Mouse	Perognathus intermedius
Desert Pocket Mouse	Perognathus penicillatus
Bailey's Pocket Mouse	Perognathus baileyi
Merriam's Kangaroo Rat	Dipodomys merriami
Desert Kangaroo Rat	Dipodomys deserti
Western Harvest Mouse	Reithrodontomys megalotis
Cactus Mouse	Peromyscus eremicus
Southern Grasshopper Mouse	Onychomys torridus
Arizona Cotton Rat	Sigmodon arizonae
White-throated Wood Rat	Neotoma albigula
Desert Wood Rat	Neotoma lepida
Coyote	Canis latrans
Kit Fox	Vulpes macrotis
Gray Fox	Urocyon cinereoargenteus
Raccoon	Procyon lotor
Badger	Taxidea taxus
Western Spotted Skunk	Spilogale gracilis
Bobcat	Felis rufus
Javelina	Tayassu tajacu
Mule Deer	Odocoileus hemionus
Source: Brown 1994; Hoffmeister 1986	

# TABLE D-3 BIRD SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PANDA GILA RIVER PROJECT

THE PANDA GILA RIVER PROJECT			
Common Name	Scientific Name		
Pied-billed grebe	Podilymbus podiceps		
Eared grebe	Podiceps nigricollis		
Great blue heron	Ardea herodias		
Great egret	Ardea alba		
Snowy egret	Egretta thula		
Cattle Egret	Bubulcus ibis		
Green-winged teal	Anas crecca		
Mallard	Anas platyrhynchos		
Northern pintail	Anas acuta		
Blue-winged teal	Anas discors		
Cinnamon teal	Anas cyanoptera		
Northern Shoveler	Anas clypeata		
Gadwall	Anas strepera		
American wigeon	Anas Americana		
Canvasback	Aythya valisineria		
Redhead	Aythyaamericana		
Ring-necked duck	Aythyacollaris		
Lesser scaup	Aythyaaffinis		
Bufflehead	Bucephala albeola		
Common merganser	Mergus merganser		
Ruddy duck	Oxyura jamaicensis		
Turkey Vulture	Cathartes aura		
Bald Eagle	Haliaeetus leucocephalus		
Northern Harrier	Circus cyaneus		
Sharp-shinned Hawk	Accipiter striatus		
Cooper's Hawk	Accipiter cooperii		
Harris' Hawk	Parabuteo unicinctus		
Swainson's Hawk	Buteo swainsoni		
Zone-tailed Hawk	Buteo albonotatus		
Red-tailed Hawk	Buteo jamaicensis		
Ferruginous Hawk	Buteo regalis		
American Kestrel	Falco sparverius		
Killdeer	Charadrius vociferus		
Gambel's Quail	Callipepla gambelii		
Rock Dove	Columba livia		
White-winged Dove	Zenaida asiatica		
Mourning Dove	Zenaida macroura		
Common Ground-Dove	Columbina passerina		
Greater Roadrunner	Geococcyx californianus		
Barn Owl	Tyto alba		
Western Screech Owl	Otus kennicottii		
Great Horned Owl	Bubo virginianus		
Ferruginous Pygmy Owl	Glaucidium brasilianum		
Elf Owl	Micrathene whitneyi		
Lesser Nighthawk	Chordeiles acutipennis		
Common Poorwill	Phalaenoptilus nuttallii		
Black-chinned Hummingbird	Archilochus alexandri		
Anna's Hummingbird	Calypte anna		

Application for Certificate of Environmental Compatibility

# TABLE D-3 BIRD SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PANDA GILA RIVER PROJECT

THE PANDA GILA RIVER PROJECT  Common Name  Scientific Name				
Costa's Hummingbird	Scientific Name			
	Calypte costae			
Rufous Hummingbird	Selasphorus rufus			
Gila Woodpecker	Melanerpes uropygialis			
Ladder-backed Woodpecker	Picoides scalaris			
Red-Shafted Northern Flicker	Colaptes cafer			
Gilded Flicker	Colaptes chrysoides			
Western Wood-Pewee	Contopus sordidulus			
Dusky Flycatcher	Empidonax oberholser			
Pacific-slope Flycatcher	Empidonax difficilis			
Cordilleran Flycatcher	Empidonax occidentalis			
Say's Phoebe	Sayornis saya			
Vermillion Flycatcher	Pyrocephalus rubinus			
Ash-throated Flycatcher	Myiarchus cinerascens			
Brown-crested Flycatcher	Myiarchus tyrannulus			
Western Kingbird	Tyrannus verticalis			
Horned Lark	Eremophila alpestris			
Tree Swallow	Tachycineta bicolor			
Violet-green Swallow	Tachycineta thalassina			
Northern Rough-winged Swallow	Stelgidopteryx serripennis			
Cliff Swallow	Hirundo pyrrhonota			
Barn Swallow	Hirundo rustica			
Common Raven	Corbus corax			
Verdin	Auriparus flaviceps			
Cactus Wren	Campylorhynchus brunneiccapillus			
Rock Wren	Salpinctes obsoletus			
Bewick's Wren	Thryomanes bewickii			
House Wren	Troglodytes aedon			
Ruby-crowned Kinglet	Regulus calendula			
Blue-gray Gnatcatcher	Polioptila caerulea			
Black-tailed Gnatcatcher	Polioptila melanura			
Western Bluebird	Sialia mexicana			
American Robin	Turdus migratorius			
Northern Mockingbird	Mumus polyglottos			
Bendire's Thrasher	Toxostoma bendirei			
Curve-billed Thrasher	Toxostoma curvirostre			
Cedar Waxwing	Bombycilla cedrorum			
Phainopepla	Phainopepla nitens			
Loggerhead Shrike	Lanius ludovicianus			
European Starling	Sturnus vulgaris			
Bell's Vireo	Vireo bellii			
Warbling Vireo	Vireo gilvus			
Orange-crowned Warbler	Vermivora celata			
Nashville Warbler	Vermivora ruficapilla			
Virginia's Warbler	Vermivora virginiae			
Lucy's Warbler	Vermivora luciae			
Yellow Warbler	Dendroica petechia			
Yellow-rumped Warbler	Dendroica coronata			
Black-throated Gray Warbler	Dendroica nigrescens			
Macgillivray's Warbler	Oporomis tolmiei			
	opo. omo tomici			

TABLE D-3
BIRD SPECIES THAT MAY OCCUR IN THE VICINITY OF
THE PANDA GILA RIVER PROJECT

Common Name	Scientific Name
Wilson's Warbler	Wilsonia pusilla
Northern Cardinal	Cardinalis cardinalis
Pyrrhuloxia	Cardinalis sinuatus
Black-headed Grosbeak	Pheucticus melanocephalus
Blue Grosbeak	Guiraca caerulea
Green-tailed Towhee	Pipilo chlorurus
Spotted Towhee	Pipilo erythrophthalmus
Chipping Sparrow	Spizella passerina
Brewer's Sparrow	Spizella breweri
Vesper Sparrow	Poecetes gramineus
Lark Sparrow	Chondestes grammacus
Black-throated Sparrow	Amphispiza bilineata
Sage Sparrow	Amphispiza belli
Lark Bunting	Calamospiza melanocorys
Song Sparrow	Melospiza melodia
Lincoln's Sparrow	Melospiza lincolnii
White-crowned Sparrow	Zonotrichia leucophrys
Dark-eyed Junco	Junco hyemalis
Red-winged Blackbird	Agelaius phoeniceus
Western Meadowlark	Sturnella neglecta
Brewer's Blackbird	Euphagus cyanocephalus
Great-tailed Grackle	Quiscalus mexicanus
Bronzed Cowbird	Molothrus aeneus
Brown-headed Cowbird	Molothrus ater
Hooded Oriole	Icterus cucullatus
Bullock's Oriole	Icterus galbula
House Finch	Carpodacus mexicanus
Lesser Goldfinch	Carduelis psaltria
House Sparrow	Passer domesticus
Source: Brown 1994; Witzeman et al. 1997	

### Aquatic Wildlife

Aquatic wildlife is non existent at the project site because of the lack of habitat. No shore birds or waterfowl were observed, although such species are not expected to be present during the summer season when the field survey was conducted (Dames & Moore 1994).

# TABLE D-4 REPTILE AND AMPHIBIAN SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PANDA GILA RIVER PROJECT

Common Name	Scientific Name
Southern Spadefoot	Scaphiopus multiplicatus
Couch Spadefoot	Scaphiopus couchii
Great Plains Toad	Bufo cognatus
Sonoran Desert Toad	Bufo alvarius
Red Spotted Toad	Bufo punctatus
Lowland Leopard Frog	Rana yavapaiensis
Desert Tortoise	Gopherus agassizii
Spiny Softshell	Trionyx spiniferus
Western Banded Gecko	Coleonyx variegatus
Common Chuckwalla	Sauromalus obesus
Zebra-tailed Lizard	Callisaurus draconoides
Long-nosed Leopard Lizard	Gambelia weslizenii
Common Collared Lizard	Crotaphytus collaris
Desert Spiny Lizard	Sceloporus magister
Tree Lizard	Urosaurus ornatus
Long-tailed Brush Lizard	Urosaurus graciosus
Side-blotched Lizard	Uta stansburiana
Desert Horned Lizard	Phrynosoma platryhinos
Western Whiptail	Cnemidophorus tigris
Gila Monster	Heloderma suspectum
Western Blind Snake	Leptotyphlops humilis
Rosy Boa	Lichanura trivirgata
Spotted Leaf-nosed Snake	Phyllorhychus decurtatus
Coachwhip	Masticophis flagellum
Western Patch-nosed Snake	Salvadora hexalepis
Gopher Snake	Pituophis melanoleucus
Glossy Snake	Arizona elegans
Common Kingsnake	Lampropeltis getulus
Long-nosed Snake	Rhinocheilus lecontei
Ground Snake	Sonora semiannulata
Western Shovel-nosed Snake	Chionactis occipitalis
Banded Sand Snake	Chiomeniscus cinctus
Night Snake	Hypsiglena torquata
Western Coral Snake	Micruroides euryxanthus
Lyre Snake	Trimorphodon biscutatus
Black-tailed Rattlesnake	Crotalus molossus
Western Diamondback Rattlesnake	Crotalus atrox
Sidewinder	Crotalus cerastes
Speckled Rattlesnake	Crotalus mitchellii
Mojave Rattlesnake	Crotalus scutulatus
Sources: Brown 1994; Stebbins 1985	

### REFERENCES

- Brown, D.E. 1994. Biotic Communities: Southwestern United States and Northwestern Mexico.
- Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press, Tucson, Arizona.
- Dames & Moore. July 1994. PacifiCorp Turbine Pipeline Project A Biological Resources Survey. Prepared by Kimberly Smith Otero, Phoenix, Arizona.
- Stebbins, R.C. 1985. A field guide to western reptiles and amphibians. Petersen Field Guides. Houghton Mifflin Co., Boston.
- Wirth Associates. 1980. APS/SDG&E Interconnection Project Transmission System Environmental Study, Phase II Corridor Studies, Volume I. Phoenix, Arizona.
- Witzeman, J., S. Demaree and E. Radke. 1997. Birds of Phoenix and Maricopa County, Arizona. Maricopa Audubon Society, Phoenix, Arizona.

## EXHIBIT E SCENIC AREAS, HISTORIC SITES AND STRUCTURES, AND ARCHAEOLOGICAL SITES

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Describe any existing scenic areas, historic sites and structures, or archaeological sites in the vicinity of the proposed facilities and state the effects, if any, the proposed facilities will have thereon."

The following items are included as exhibits:

- Exhibit E-1: Scenic Areas/Visual Resources
- Exhibit E-2: Historic Sites and Structures and Archaeological Sites
- Exhibit E-3: Preliminary Site Plans

### EXHIBIT E-1 SCENIC AREAS/VISUAL RESOURCES

The proposed project site is located on the northeastern edge of the Town of Gila Bend, Arizona. As shown on the project map, the site is flat, irrigated agricultural (alfalfa) land and disturbed Sonoran desert scrub. Site elevation ranges from approximately 675 feet to 735 feet and is surrounded by undeveloped desert lands of low to average scenic quality. Other adjacent cultural modifications include 299<sup>th</sup> Avenue (west of site) and Watermelon Road (south), and three ranch residential complexes (located within 1 mile of the site). A utility corridor parallels Watermelon Road and the southern boundary of the property and includes two transmission lines—a 230kV and 69kV.

The Gila River is approximately 1.5 miles north of the site with the Gila Bend Mountains north of the river. No other mountains are in close proximity.

### **Key Observation Points**

Key observation points consist of locations from which viewers, who may have a concern for scenic resources, will view a landscape or will be exposed to project activities. Sensitive viewpoints generally include transportation routes, residential areas, and recreational use areas.

Key observation points within the visual study area include the following:

### A. Roads

- 1. State Route 85 (approximately 1.5 miles)
- 2. Interstate 8 (beyond 3 miles)
- 3. Old Highway 80 (approximately 0.5 mile)
- 4. Secondary and residential roads in Gila Bend (Watermelon Road and 299<sup>th</sup> Avenue are within 0.5 mile)

#### B. Residences

- 1. Gila Bend residences (approximately 2 miles)
- 2. San Lucy Village residences (approximately 1.5 miles)
- 3. Residences (2 farmsteads are located within ½ mile of the project site, and an additional 3 farmsteads and approximately 19 scattered residences are located within 1 mile)

### C. Recreation Use Areas

1. Proposed Gatlin Site Cultural Park (¼ mile)

### Potential Effects to Visual Resources

Impacts to visual resources will result from the contrast (form, line, color, and texture) created by the proposed project. The eight stacks associated with the proposed project will be the most visible plant features. Very little of the remainder of the facility will be visible because of the intervening desert landscape. Those viewers (residents) within close proximity (1 mile) will have the greatest impact since the proposed project would become a dominant feature in the environment. Although portions of the project would be visible from area residents, the majority of the population is over 2 miles away. Area residents would view the project intermittently beyond the existing 85-foot 230kV line, a strong vertical element in the landscape.

Views of the project from Old Highway 80 (½ mile away) and Interstate 8 (more than 3 miles) are expected to be intermittent because of vegetation and terrain between the road and the proposed project. No impacts to existing recreational resources were identified. A potential future Gatlin Site Cultural Park is located ¼ mile from the site.

The proposed plant site would be modified from an agricultural/pastoral and desert landscape to an industrial landscape. The generally agricultural and desert landscape surrounding the site would not be modified.

### Mitigation

The colors of the proposed facilities will harmonize, to the extent possible, with the existing landscape. This mitigation will be most effective for Gila Bend residents and highway travelers, especially when the project is backdropped by area mountains. For viewers visiting the proposed Gatlin recreation site, a landscape plan will be prepared to maximize the screening of the facility through the use of vegetation and berming. The plan will be implemented in conjunction with the Town's general plan amendment. In addition, the Applicant has provided conceptual regional and site plans to mitigate visual impacts as well as meeting the Town's objectives (see Exhibit E-3).

## EXHIBIT E-2 HISTORIC SITES AND STRUCTURES AND ARCHAEOLOGICAL SITES

A cultural resource study was conducted to identify any historic sites and structures or archaeological sites in the vicinity of the proposed project site and how they might be affected by the construction of the project. This portion of the exhibit summarizes the results of the records review and field survey, which are fully documented in Exhibit J-6.

### **Records Review**

Records were reviewed at the following agencies and research institutions:

- State Historic Preservation Office
- Arizona State Museum (ASM)
- Museum of Northern Arizona
- Pueblo Grande Museum
- Department of Anthropology at Arizona State University
- State Office and Phoenix Field Office of the Bureau of Land Management

The goal of this review was to identify any prior cultural resource surveys and recorded archaeological and historical sites within approximately 2 miles of the proposed project. The search area encompassed approximately 29 square miles.

The review of agency, museum, and university files documented 31 cultural resource studies that had been previously conducted in the vicinity of the project area. Many of these surveys were associated with the construction and operation by the U.S. Army Corps of Engineers of the Painted Rocks Dam.

Cultural resource surveys conducted in the area have recorded a total of 62 archaeological and historical sites within a 2-mile radius of the proposed power plant. More than 80 percent of these sites reflect aboriginal occupations, primarily by the Hohokam and Patayan with some possible Archaic era components. Ten of the sites appear to be remnants of aboriginal village sites, and ballcourts mark three of the sites as major centers of population. Another seven sites are artifact scatters that may represent other small villages, campsites, or temporary work locations, such as places where plant foods were cooked in pit hearths. Eleven of the sites have petroglyphs, which commonly are associated with other artifacts and sometimes with rock features. Nineteen of the sites have trails, and commonly these are associated with artifacts or features indicating an aboriginal origin.

A few of the sites have both aboriginal and historical Euro-American artifacts. Nine of the sites date from the historical era. Two of these might be Tohono O'odham settlements. Another is the Gila Bend stage station along the Butterfield Road, and the road itself also is recorded as a historical site. Other historical sites include the Southern Pacific Railroad and a Chinese labor

camp apparently associated with the original construction of the line. Another historical property is a 1934 highway bridge that is listed on the National Register of Historic Places. Two other historical archaeology sites are more recent. One site apparently is remnants of a rodeo facility dating from the 1940s and another is the ruins of a tourist court that may date as late as the 1960s.

Within Section 20, but north of the proposed project, two sites were identified. Little is known about the first site, AZ Z:2:6 (ASM), described as a small group of scattered houses and two cremations. This site, along with other destroyed villages, probably were outlying habitation areas associated with the ceremonial center represented by the Gatlin Site Cultural Park. The location of this site was subsequently developed for agriculture, and today is irrigated alfalfa fields.

The second site that is partially within Section 20 is the Gatlin Site National Historic Landmark, AZ Z:2:1 (ASM), on which the Gatlin Site Cultural Park has been planned. This site contained more than 30 trash mounds, 2 ballcourts, and 1 of the earliest platform mounds built within the Hohokam area. Excavation of the platform mound revealed that it had been modified and expanded several times, and eventually came to cover an area measuring about 75 feet by 95 feet and stood about 12 feet high. A crematorium and a large irrigation canal that headed some 5 miles upriver also were documented. Despite extensive testing, only two house floors were found. The site appears to have been occupied during the Santa Cruz, Sacaton, and Santan phases or perhaps more than 400 years between about AD 750 to 1200. However, the most intense period of occupation could have been for a much shorter period of time.

The boundaries of the National Historic Landmark were more or less arbitrarily defined to encompass the core of the site. The boundary was verbally described as a rectangular area measuring 2,250 feet north-south by 3,000 feet east-west. The site was described as encompassing 190 acres, although the described rectangle encompasses only about 150 acres. He has recommended that the boundaries be redrawn to eliminate the portion of the landmark east of Stout Road because agricultural development had obscured all surface manifestations of the site. This includes the portion of the landmark within Section 20. The National Park Service, the agency that designates National Historic Landmarks, has not acted on this recommendation.

### Field Survey

A field survey was conducted by a six-person team for a 255-acre parcel of Section 20. The survey crew walked observational transects at intervals of 50 feet or less using 7.5-minute USGS topographic quadrangles and an aerial photograph.

The crew found no archaeological sites but did record four isolated occurrences of archaeological materials. A few sherds of broken Hohokam ceramic vessels were found at each isolated occurrence, and one informal shopping/scraping stone tool was found at one of the isolates. These isolated finds do not have historic values that warrant preservation.

The surveyed parcel overlapped into the alfalfa fields and the southern portion of the plotted location of the previously recorded site AZ Z:2:6 (ASM), but the survey crew noted no indications of the site. The proposed plant site is approximately 700 to 800 feet south of the plotted location of site AZ Z:2:6 (ASM), and there is no indication that construction of the plant would disturb the site.

### **SUMMARY**

No significant archaeological or historical properties appear to be threatened by ground disturbing activities associated with the proposed development of the project. Although the proposed plant will conform to land use plans, potential visual and noise intrusions could occur into the setting of the proposed, but not yet funded or developed, Gatlin Site Cultural Park. As the site is being rezoned for industrial use, the Applicant has developed measures to mitigate the visual and noise intrusions of the proposed power plant into the settings of the proposed Gatlin Site Cultural Park (see Exhibits B and E-3).

If any human remains or funerary objects were to be unexpectedly discovered, they should be reported to the director of the Arizona State Museum in accordance with ARS 41-865. As more detailed plans are developed for the plant and related facilities in areas not previously surveyed, additional cultural resource inventory survey may be considered.

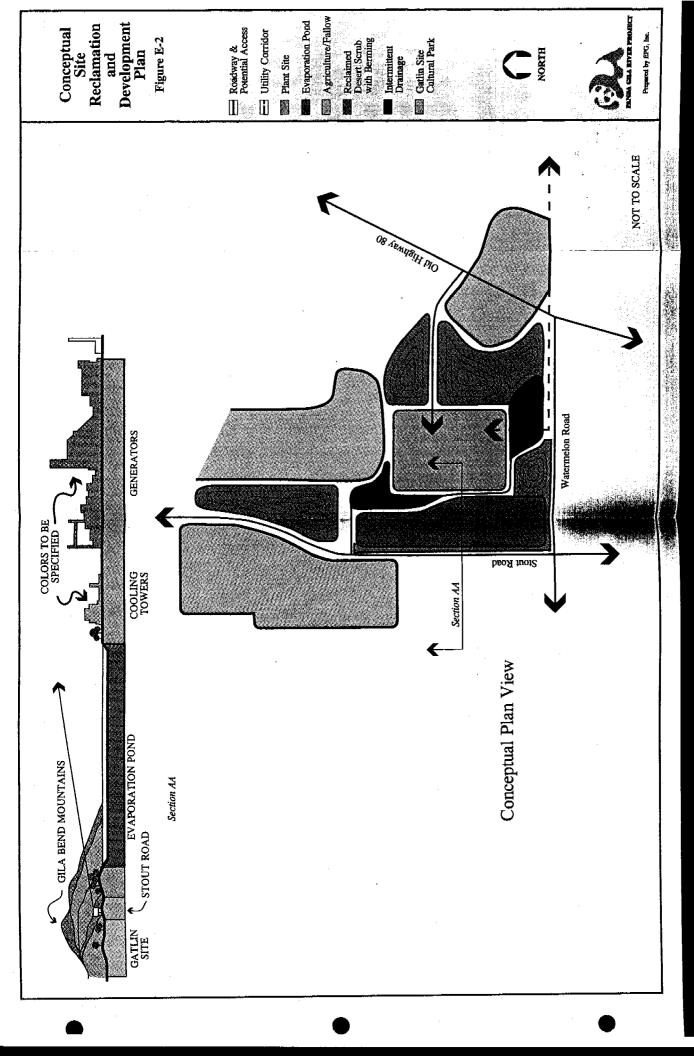
## EXHIBIT E-3 PRELIMINARY SITE PLANS

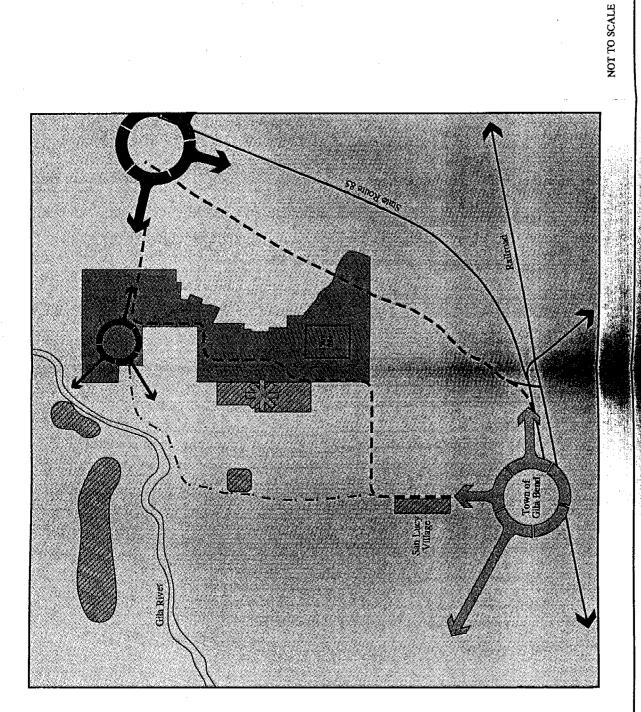
The following figures are attached:

- Figure E-2 Conceptual Site Reclamation and Development Plan
- Figure E-3 Conceptual Recreational Development Plan

These plans are preliminary and have been prepared in coordination with the Town of Gila Bend to mitigate potential visual and noise impacts. These plans will continue to be modified to ensure compliance with the general plan amendment and planning for the Gatlin Site Cultural Park.

It is important to note that the initial concepts used to develop these plans were a result of the direction provided by the Town of Gila Bend's Strategic Plan for Economic and Community Development (see Exhibit J-4) and the Town manager. While the project will help the Town of Gila Bend meet or exceed its economic goals the conceptual plans presented in this exhibit illustrate the Applicant's sensitivity to the goals of (1) the quality of life preservation and enhancement and (2) tourism development.





Development Plan Recreational Conceptual Figure E-3 Historic/ Archaeological Site

Gatlin Site

Scaller Center QCenter

Interpretive

C Open Space Trail

Panda Gifa River, L.P. Property Boundary

NORTH



Prepared by EPG, Inc.

# EXHIBIT F RECREATIONAL PURPOSES AND ASPECTS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"State the extent, if any, the proposed site or route will be available to the public for recreational purposes, consistent with safety considerations and regulations and attach any plans the applicant may have concerning the development of recreational aspects of the proposed site or route."

The construction, operation, and maintenance of the proposed facilities will be consistent with safety considerations, and will not be open to public access.

## EXHIBIT G CONCEPTS OF TYPICAL FACILITIES

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

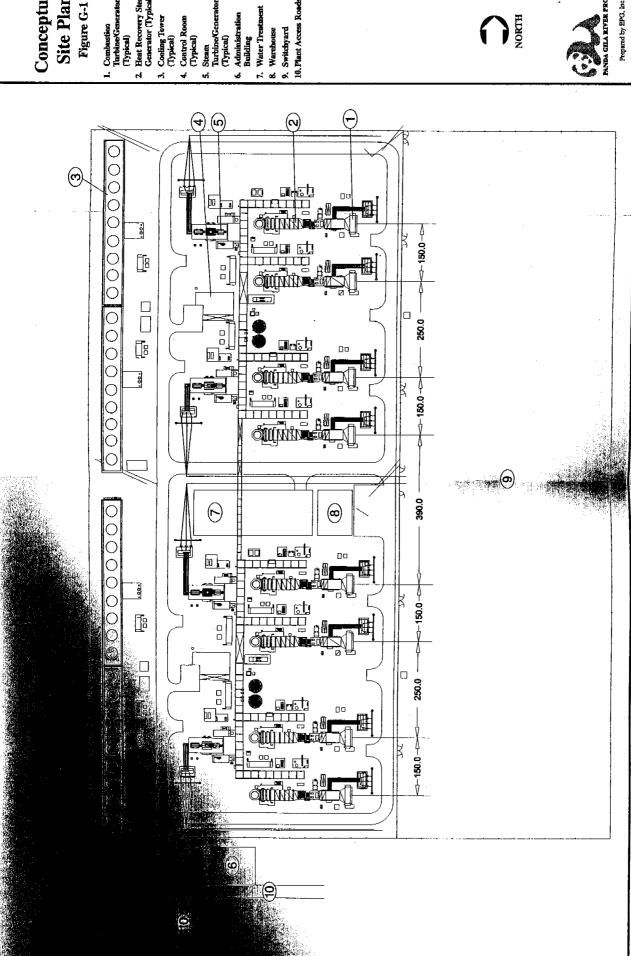
"Attach any artist's or architect's conception of the proposed plant or transmission line structures and switchyards which applicant believes may be informative to the committee."

### CONCEPTS OF TYPICAL FACILITIES

Figure G-1: Conceptual Project Site Layout

Figure G-2: Conceptual Elevation of Generating Facilities
Figure G-3: Typical Site Plan and Elevations of Switchyard

Figure G-4 and 5: Photosimulations



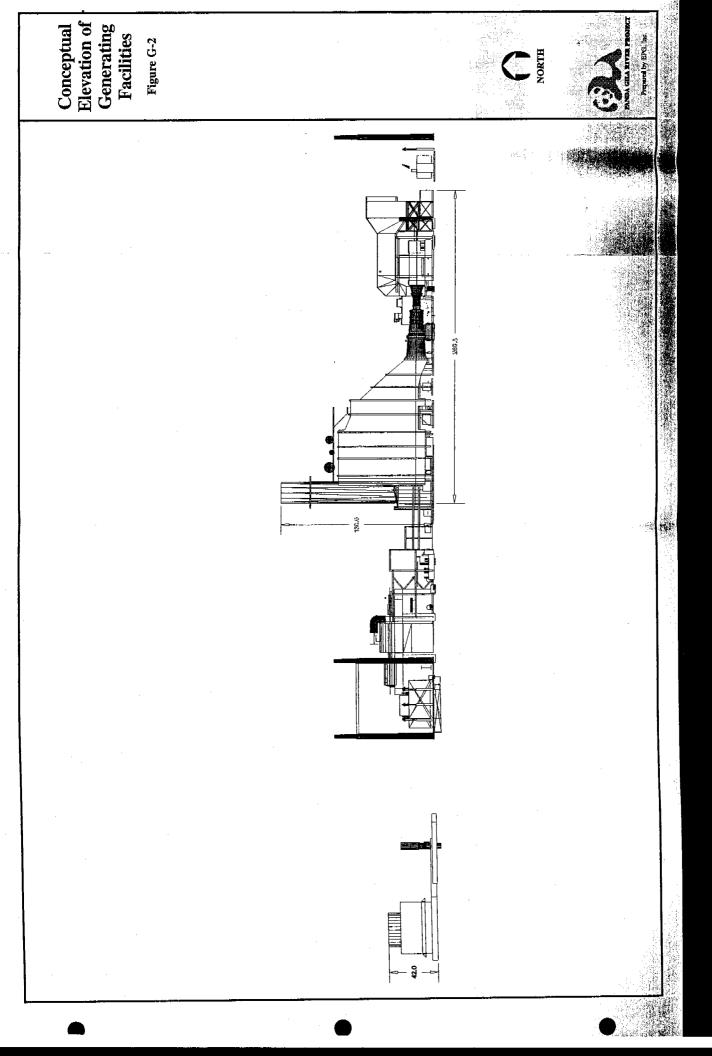
## Conceptual Site Plan

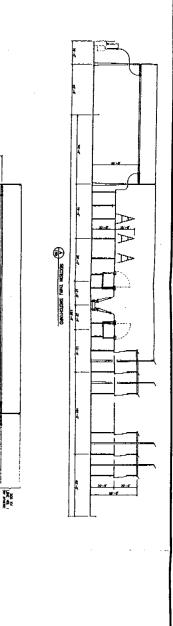
- 1. Combustion Turbine/Generator (Typical)
- Heat Recovery Steam Generator (Typical)

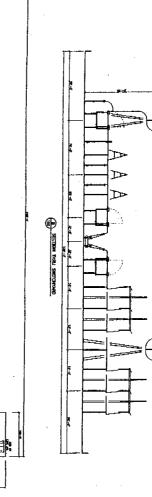
NORTH

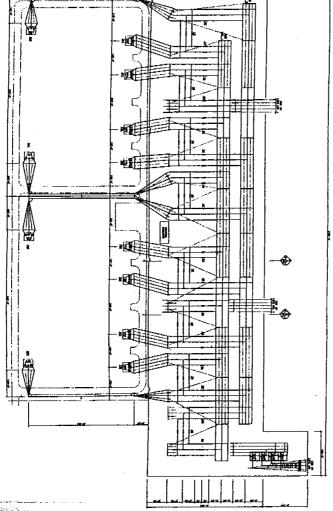


Prepared by EPG, Inc.









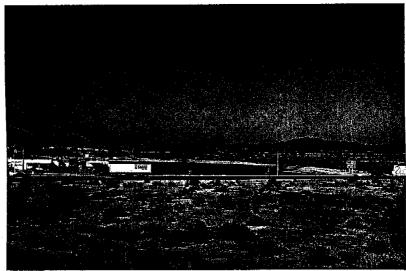
Typical Site Plan and Elevations for Switchyard

Figure G-3

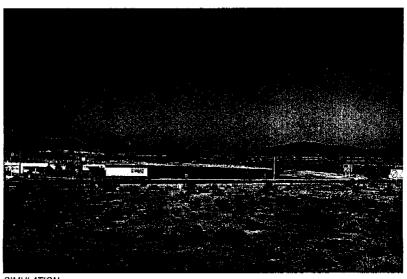
Source: GE Industrial Systems, 1999.



Prepared by EPG, Inc.



EXISTING CONDITIONS

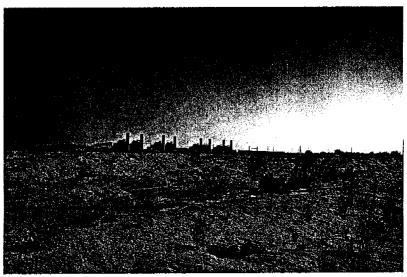


SIMULATION

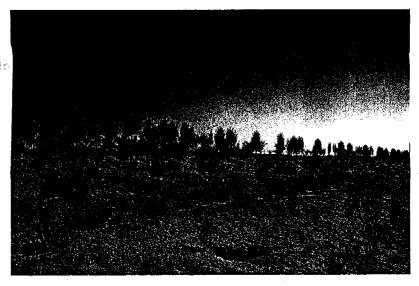
PANDA GILA RIVER PROJECT VISUAL MASSING STUDY VIEWPOINT 12 FROM BUTTERFIELD ROAD OVERPASS Figure G-4



**EXISTING CONDITIONS** 



SIMULATION



SIMULATION WITH VEGATATIVE SCREENING AND BERMING

PANDA GILA RIVER PROJECT VISUAL MASSING STUDY VIEWPOINT 5 FROM STOUT ROAD NEAR GATLIN ARCHEOLOGICAL SITE Figure G-5

### EXHIBIT H EXISTING PLANS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"To the extent applicant is able to determine, state the existing plan of the state, local government, and private entities for other developments at or in the vicinity of the proposed site or route."

Existing and planned land uses are described in Exhibits A and B-1. A general plan amendment is currently underway to modify land use designations and rezone the Applicant's property within Section 20 to a Basic Manufacturing, Extraction and Materials Processing Industrial Zone (I-3). The town manager of Gila Bend has initiated this process by hiring a consultant to prepare the general plan amendment.

A records search was completed through Maricopa County's Planning and Development Department, and indicated that no plans for any development have been submitted to the County for unincorporated land within 2 miles of the project site. Through contacts with the town manager of the Town of Gila Bend, it was determined that some interest exists in developing parcels in the vicinity of the project site. Although plans have not been submitted formally to the Town, developments under discussion include two recreational vehicle parks to be located tentatively 1 mile west of the project site, north of Watermelon Road, and south of the Applicant's property. The property owners have been informed of the proposed project.

Letters were sent to state, local government, and private entities, indicated in the table on page H-2, to request information on developments in the vicinity of the project site. Attachments to this exhibit provide copies of the responses that were received. Based on this information, the Applicant is unaware of any additional planned developments within a 2-mile radius of the project site.

Name and Affiliation	Date Letter Sent	Date of Response	Comments
Carl Stephani	12/03/99	01/18/00	Letter attached.
Town Manager			
Town of Gila Bend			
Neil Urban	12/03/99	12/08/99	Received telephone call from
Planning and Development			Mark Wheaton. Noted that the
Department, Maricopa County			area is subject to lot splits and
			suggested we contact the Town
			of Gila Bend.
Jason Lipsey	12/03/99	12/08/99	Letter attached.
Project Director			
Southwest Agribusiness			
Services (Paloma Ranch)			
Mark Gavan	12/03/99	12/13/99	Sent information related to the
Principal			studies underway.
EEC Consulting (conducting			
drainage study in the area)			
Gordon Taylor	12/03/99	N/A	No response.
Planner			
Arizona State Land			
Department			



### PALOMA RANCH INVESTMENTS, LLC

Jason Lipsey, Project Director 2845 East Camelback Road, Suite 700 Phoenix, Arizona 85016

Tel: 602.224.4570 Fax: 602.224.1371

E-mail: Jason@southwestag.com

December 8, 1999

Garlyn Bergdale Environmental Planning Group, Inc. 4350 E. Camelback Road, Suite G-200 Phoenix, AZ 85018

Dear Garlyn,

Thank you for the opportunity to comment on the potential development plans of Paloma Ranch in the vicinity of Panda's proposed plant site. Paloma Ranch welcomes Panda to the Gila Bend area and looks forward to a long-term positive relationship.

At this time, Paloma Ranch has no development plans for our property near Panda's proposed site. Paloma does intend to continue marketing this property to interested parties.

Sincerely,

Vason Lipsey

Project Manager



### **TOWN OF GILA BEND**

The Heart of Arizona

January 18, 2000

Ref:

Panda Gila River Project General Plan Amendment

To Whom It May Concern:

The Town of Gila Bend has initiated a General Plan Amendment to revise its 1996 General Plan. The amendment includes a new planning area of approximately 3,200 acres (five square miles) annexed since the 1996 General Plan adoption. Through the amendment process, this new planning area will have land use and circulation elements developed to ensure compatibility with the balance of the incorporated area.

The General Plan Amendment will also provide for the accommodation of the proposed Panda Gila River, L.P., power generation facility that they are planning for inclusion in the new planning area. The planning process will include the evaluation of, and recommendations for expansion of, the existing Town of Gila Bend infrastructure (i.e. potable water, wastewater treatment, sanitary sewer, etc.) as required by the new facility.

To complete the project, the Town has retained a consulting team. Partners for Strategic Action (PSA), Inc., of Fountain Hills, Arizona, leads the team. Assisting PSA in their areas of specialization will be The Environmental Planning Group (EPG) and David Evans & Associates (DEA), both of Phoenix. The team has expertise in community planning, economic development, public participation, environmental planning, GIS and mapping, and civil transportation engineering.

The planning process will include inventory and analysis of the planning area including socioeconomics, housing, infrastructure, land ownership and a thorough analysis of the existing General Plan and Zoning Ordinance. Following this preliminary work, a forum will be held with landowners and significant stakeholders in the planning area to identify issues and receive ideas. Using this information, land use and circulation scenarios will be drafted and goals, objectives, and policies developed. We will analyze the preferred scenario to ensure consistency with the current General Plan and surrounding area plans.

The Draft General Plan Amendment will then go through the required 60-day review period that will include submission of the document to other organizations that may be affected by activities and uses in the planning area. These organizations will include Maricopa County, the Arizona

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State Land Department, United States Air Force, Bureau of Land Management, and Bureau of Reclamation.

After the review period, relevant comments and concerns will be weighed and a final Draft Plan Amendment will be submitted to the Planning Commission for review. A public hearing will be held by the Commission to receive any public comments and the Commission will make a recommendation to the Town Council.

The Town Council will then hold a public hearing to receive any additional public opinion. At the pleasure of the Council they will then officially adopt the General Plan amendment. The target date for adoption is June 1, 2000.

Yours very truly,

Carl J. Stephani Town Manager

# EXHIBIT I ANTICIPATED NOISE/INTERFERENCE WITH COMMUNICATION SIGNALS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Describe the anticipated noise emission levels and any interference with communication signals which will emanate from the proposed facilities."

A report was prepared for the project to measure ambient noise conditions at the site and model the noise impacts that could result from the construction and operation of the plant. The report is summarized as part of Exhibit B and included as Exhibit J-7.

No interference with communication signals will be caused by the project.

### EXHIBIT J SPECIAL FACTORS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Describe any special factors not previously covered herein, which applicant believes to be relevant to an informed decision on its application."

The special factors described in this exhibit are as follows:

- The public involvement program has been an important means to work with the Town of Gila Bend, by answering questions and receiving input from the community. The program is described below and public information materials, meeting materials, letters received by the Applicant, and a discussion of the project's contribution to meeting the goals of the Town of Gila Bend's Strategic Plan for Economic and Community Development are included as Exhibits J-1 through J-4.
- The complete environmental reports for cultural resources, groundwater, and noise are included as Exhibits J-5 through J-7.
- A copy of the Application for Determination of Exempt Wholesale Generator Status has been included as Exhibit J-8.

#### PUBLIC INVOLVEMENT PROGRAM

A public involvement program was initiated for the project once the Applicant formally announced its intention to construct the plant. The purpose of the program is to inform the community of the project; solicit feedback regarding potential issues or areas of concern related to the project; and provide a means to answering questions or addressing concerns.

Several tools were developed to meet the objectives of the public involvement program, and are described below.

Newsletters. A newsletter was distributed to every postal address (approximately 1,100) in the area of the proposed plant and Gila Bend in late October 1999 to introduce the project and the Applicant (a copy is included in Exhibit J-1). In February 2000, a second newsletter will be distributed to the same addresses and individuals who have requested information, to describe the studies that were completed as part of this application and update the community on the status of the project. The second newsletter will be bilingual in response to requests from the public.

**Telephone Information Line.** The bilingual telephone information line provides people with the opportunity to hear about upcoming public meetings, leave a message requesting that a project team member return their call, be placed on the mailing list, or provide comments.

Public Open Houses. A public open house was held on November 4, 1999 in Gila Bend between 5:00 and 8:00 p.m. (meeting materials are included in Exhibit J-2). Approximately 40 members of the community attended the meeting. The open house format offered an opportunity for people to talk with the Applicant and environmental consultants and have questions answered. Comment forms were provided for those who preferred to document comments in writing or anonymously. In addition, representatives from the Applicant provided a formal presentation and answered questions from the group. In addition, the Applicant prepared a presentation and answered questions at a Gila Bend Town Council meeting on October 19, 1999.

### Briefings to public officials and members of the community.

The table on the following pages summarizes key contacts and briefings conducted by the Applicant.

### FEEDBACK AND ISSUES IDENTIFICATION

Overall, economic development issues have been the most prominent. The community is interested in the provision of jobs, tax revenue, and other benefits to the local economy. Questions directed to the Applicant's representatives during the November public open house identified a strong interest in those benefits, concern that the Applicant utilizes local businesses, and concerns about the longevity of the plant in providing those benefits. The town manager also expressed a concern for plant visibility from residences along Butterfield Road, residences in Gila Bend, area parks, and Old Highway 80. Visibility analyses were completed from the key observation points (see Exhibit E). Additional questions have related to water use (drawdown at nearby wells) and air emissions, and the impact the plant would have on the community in those areas. To address those issues, the Applicant has made copies of the studies available to interested parties as they are available, and will continue to communicate with the public on the relevant mitigation measures and study findings.

	TABLE J-1	
	PANDA GILA RIVER PROJECT	ER PROJECT
	COMMUNITY CONTACTS AS OF JANUARY 11, 2000	S OF JANUARY 11, 2000
Date	Group or Person	Comments
September 15, 1999	Arizona House of Representatives	Provided overview of project and the Applicant's perspective on developing
	Speaker Jeff Groscost	merchant plants that will produce competitive low-priced electric power.
		Speaker was very interested in the project and requested to be kept informed.
September 30, 1999	Town of Gila Bend Mayor Chuck Turner	Introduced the project and Applicant to the Town. Discussed the schedule of
	and Town Manager Carl Stephani	activities and how the Applicant would be working with the Town. Very
		supportive, looking forward to helping the project be successful.
October 11, 1999	Town of Gila Bend	Discussed the communication plans and mayor provided names of local
	Mayor Chuck Turner	residents to talk to in Gila Bend. Discussed some of the community concerns
1,000		that should be addressed in the communication plan.
October 14, 1999	Town of Gila Bend Chamber of Commerce	Provided overview of the project along with the jobs and support services that
	President Ralph Walls and	would be generated. Expressed support and continued desire to be informed
	Vice President Linda Davis	about future activities associated with the project.
October 14, 1999	Gila Bend Unified School District No.24	Provided overview of the project and how the project might work together with
	Superintendent Steve Marshall	the school. Very supportive and requested to be informed about future
		activities associated with the project. Offered the use of school facilities for
		public meetings.
October 10, 1999	Adjacent Landowners	Introduced the project and discussed how the Applicant would work with them
	Polly and Marion Getzwiller	as a neighbor.
	Theresa and Joe Getzwiller	
October 19, 1999	United States Senator John McCain	Briefing on the project was provided to each senator's staff on an individual
	Staff Personnel	basis. Generally supportive and appreciated of the information.
	United States Senator Jon Kyl	=
	Staff Personnel	
	United States Senator Ed Pastor	
	Staff Personnel	
October 19, 1999	Arizona State Senate	Introduced the project and Applicant. Discussed the schedule of activities, jobs
	Senator Edward J. Cirillo, District 15	and the growth of the Town because of the project. Very supportive, looking
10.00		Torward to further information on the project.
October 19, 1999	Arizona House of Representatives Speaker Jeff Groscost	Update on the project.

Application for Certificate of Environmental Compatibility

	TABLE J-1	
	PANDA GILA RIVER PROJECT	ER PROJECT
	COMMUNITY CONTACTS AS OF JANUARY 11, 2000	S OF JANUARY 11, 2000
Date	Group or Person	Comments
October 19, 1999	Town of Gila Bend Town Council	Made an introduction of the Applicant and the project at the Town Council
	Mayor Chuck Turner	meeting. Discussed the schedule of activities, the plant's combined-cycle
	Town Manager Carl Stephani	process, jobs, support services, and community involvement. Answered
	Vice Mayor Fred Hull	questions from the council members and general public. Feedback –
	Councilman Bill Henry	informative, helpful, and hoped that the project was for real. In the past, other
	Councilman Steve Holt	types of industries have shown interest in coming to Town and have not. About
	Councilman Richard Stuart	20-25 were in attendance.
	Councilman Bud Turner	
October 19, 1999	The Gila Bend Sun – Gila Bend, AZ Glen Birchfield	Provided press release and general background to reporter.
October 20, 1999	Arizona House of Representatives	Introduced the project and provided an overview of the Applicant. Discussed
	Representative Mike Gleason, District 15	the schedule of activities, jobs and the growth of the Town. Supportive and
	Representative Jerry Overton, District 15	requested to be updated on further activities on the project.
	Representative Joe Hart, District 2	
October 20, 1999	Board of Supervisors Maricopa County	Briefing on the project and overview of the Applicant. Discussed the schedule
	Supervisor Mary Rose Wilcox	of activities, jobs and the growth of the Town. Requested to be updated on
		further activities on the project, very supportive.
October 20, 1999	The Arizona Republic - Phoenix, AZ	Provided press release and general background to reporter.
	Max Jarman	
October 21, 1999	Town of Gila Bend	Discussed the newsletter and open house format. Suggested the meeting be
	Town Manager Carl Stephani	held at the Town Hall.
October 21, 1999	Town of Gila Bend	Discussed the newsletter distribution and the best time to deliver to the 1,100
	Postmaster Ralph Walls	in zip code 85337.
October 27, 1999	Town of Gila Bend	Introduced the project and provided an overview of the Applicant. Showed a
	Chamber of Commerce Mixer	video on the Applicant. Discussed the schedule of activities, jobs and the
		growth of the Town. Questions focused on jobs and services that the Town
		could provide.
October 27, 1999	Community Development	Discussed potentially applicable provisions in Gila Bend and planning for the
	Town of Gila Bend	Gatlin Site Cultural Park.
	raipii vasquez	

Application for Certificate of Environmental Compatibility

Application for Certificate of Environmental Compatibility

	TABLE I.1	
	PANDA GILA RIVER PROJECT	ER PROJECT
	COMMUNITY CONTACTS AS OF JANUARY 11, 2000	LS OF JANUARY 11, 2000
Date	Group or Person	Comments
November 23, 1999	Town of Gila Bend Chamber of Commerce	The Applicant participated in the Chamber of Commerce Benefit Roping for
	President Ralph Walls	two and a half year old Katelyn Carpenter.
November 29, 1999	Town of Gila Bend	Update on the project.
The state of the s	Town Manager Carl Stephani	
November 29, 1999	Gila Bend Unified School District No.24	Update on the project.
	Superintendent Steve Marshall	
December 1, 1999	Town of Gila Bend	Update on the project.
7,10	Mayor Chuck Turner	
December 1, 1999	Town of Gila Bend	Discussed with the Town providing potable water and sanitary sewer to the
	Town Manager Carl Stephani	Project site. Meeting was good.
December 2, 1999	San Lucy Village	Briefing on the project and provided an overview of the Applicant. Discussed
	Chairperson Ernestine Marquez	the schedule of activities and how the project could work with the San Lucy
	VDI Board	Village. Receptive to meeting and appreciative to the information shared.
	Vice Chairman Norbert Ortega	
December 6, 1999	Arizona Corporation Commission	Briefing on the project and provided an overview of the Applicant. Discussed
	William A. Mundell	the schedule of activities and how the project has been working with the Town
7 10 10 10 10 10 10 10 10 10 10 10 10 10	Executive Assistant Hercules A. Dellas	of Gila Bend. Receptive to meeting and appreciative to the information shared.
December 6, 1999	Town of Gila Bend	Working meeting regarding the photo simulations of the project. Discussed
	Town Manager Carl Stephani	possible mitigation using colors.
December 6, 1999	Arizona State Senate	Update on the project.
	Senator Edward J. Cirillo, District 15	
	Arizona House of Representatives	
	Representative Mike Gleason, District 15	
	Representative Jerry Overton, District 15	
	Representative Joe Hart, District 2	
December 7, 1999	Arizona Corporation Commission	Briefing on the project and provided an overview of the Applicant. Discussed
	Utility Division Staff	the schedule of activities and specific technical details associated with the
		project. Staff was appreciative of the information that was provided.

Application for Certificate of Environmental Compatibility

L.T.	PANDA GILA RIVER PROJECT UNITY CONTACTS AS OF JANHARY 11, 2000	Comments	Working meeting regarding the zoning and the general plan regarding the	project.		Update on the project.	Discussed the initiation of a name alon amandment and an initiation of a name and a name	Discussed the minimum of a general plan amendinent and reviewed land use information.				Working meeting regarding the zoning and the general plan regarding the	project.	,					Working meeting regarding the photo simulations of the project. Discussed	possible mitigation using colors and landscaping.	Working meeting regarding the zoning and the general plan regarding the	project.	Discussed the project and noise studies that would accompany the CEC	application.			Discussed the project; Mr. Myers had attended the November public meeting.	
TABLE J-1	PANDA GILA RIVER PROJECT COMMUNITY CONTACTS AS OF JANIAN		Town of Gila Bend	Mayor Chuck Turner	Town Manager Carl Stephani	Board of Supervisors Maricopa County	Town of Gila Bend	Town Manager Carl Stephani	Latham & Associates, Inc.	Consultant to the Town of Gila Bend	Robert Latham	Town of Gila Bend	Mayor Chuck Turner	Town of Gila Bend	Town Manager Carl Stephani	Latham & Associates, Inc.	Consultant to the Town of Gila Bend	Robert Latham	Town of Gila Bend	Town Manager Carl Stephani	Town of Gila Bend	Town Manager Carl Stephani	Partners for Strategic Action	Consultant to the 10wn of Gila Bend	Project Manager Lony Davis	May be planning an KV park development at 307th Avenue and Watermelon Road	Adjacent Landowner Kent Myers	TANIE ITTY OLD
		Date	December 8, 1999			December 8, 1999	December 13, 1999					December 14, 1999							December 30, 1999		January 3, 2000		January 3, 2000				January 3, 2000	

Application for Certificate of Environmental Compatibility

J-1	VER PROJECT	UNITY CONTACTS AS OF JANUARY 11, 2000	Comments	Discussed the project and offered to meet in order to answer any questions.	Met to discuss the project and the infrastructure associated with it.	Update on the project.
TABLE J-1	PANDA GILA RIVER PROJECT	COMMUNITY CONTACTS	Group or Person	Adjacent Landowner Michael Minyard	Adjacent Landowners Kent Myers and Tom Zirbes	Arizona House of Representatives Speaker Jeff Groscost
			Date	January 7, 2000	January 10, 2000	January 11, 2000

# PASSOAGILARIVER PANDA-GILA NEWSLETTER FALL 1999

### PANDA ENERGY COMES TO TOWN

Panda Energy International plans to construct a 2,000-megawatt power generating plant, Panda Gila River, L.P.. The plant will provide timely new capacity to meet the rising demands of Arizona and the desert southwest. The lant will be located 3 miles northeast of Gila Bend in Maricopa County and 75 miles southwest of Phoenix.

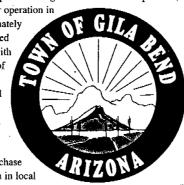
Because Panda is on the forefront of the best facility for each community. Gila Bend will have the most advanced technology available today. Panda has confirmed the purchase order for General Electric (GE) Turbines and has secured the water and land necessary for the project. The plant's cooling system will use less water from the aquifer than was previously used for farming on the plant site. This is good news for everyone near Gila Bend.

## PANDA GILA RIVER BRINGS NEW OPPORTUNIES

The Panda plant is expected to begin construction in September,

2000 and be ready for operation in June, 2002. Approximately 450 jobs will be created during construction with an estimated payroll of \$50 million.

Approximately 60 full time jobs will be created during normal operation. During construction, the Gila River project will purchase about \$10-\$15 million in local



materials and services. Once operation has begun, \$5-\$8 million in local purchases will be made each year. The Panda project will also contribute approximately \$2-\$3 million in taxes to the community and schools. Panda makes every effort in each new partner community to hire locally and to purchase local goods and services.

For more information in English (para información en Español) toll free in Arizona 877-522-9099, in Phoenix 602-522-2466.

Broad-based support for the Panda facility is already being heard around the state and the town. Various public officials recently expressed their excitement about the opportunities Panda brings to the area. "The citizens of Arizona are beginning to see the real benefits of electric deregulation," said Speaker of the Arizona House Representatives, Jeff Groscost, R-Mesa. "This plant promises to be environmentally safe, create good jobs in rural Arizona, and produce competitive low-priced electric power."

Chuck L. Turner, mayor of Gila Bend, said Panda's entry into Maricopa County and the Gila Bend community "is a wonderful boon to our economy. We pride ourselves on this community and know that Panda is going to be a great addition to our growth and development."

Steve Marshall, superintendent of schools, said Panda's plant would be beneficial for residents of our community by providing construction jobs and employment after the project is built. "This plant would also provide a needed tax base for our school district for improving facilities on our campus. Students would benefit by a developing partnership with the school to put students in touch with on the job technology," he said.

Join us for a Panda Town Hall meeting at 644 West Pima November 4 from 5:00pm to 8:00pm

### PANDA, THE COMPANY

Panda Energy International Inc. is an independent power company that is engaged principally in the development, acquisition, ownership and operation of electric power generation facilities, in the United States and abroad. Since founding the Company in 1982, Robert (Bob) W. Carter has assembled a team of diversified talents required to support the effective development and operation of power generation facilities. This core team has positioned Panda as one of the leading project development companies in the independent power sector.

Panda's first project, Panda Rosemary in Roanoke Rapids, NC was built in 1990 and is a 180 MW combined cycle cogeneration facility. Panda Brandywine, 240 MW, just 17 miles from our nation's capitol, supplies 10% of that city's baseload power. Other Panda projects are in development today in Texas, Florida, Pennsylvania, Arkansas and Oklahoma representing an additional 9000 MW of new incremental gas-fired capacity that will—be-operational-over the period ending inmid-2002.

All power plant construction companies have three requirements for successfully locating a site, a need for electricity, natural gas availability and a secure water supply. Panda has a fourth, receptive community. Panda seeks to develop relationships with the communities in which it operates and places a high priority on giving back to communities wherever possible. This is a core belief of Bob Carter, founder and CEO and also of Panda.

The final consideration is environmental compatibility. Panda is very sensitive to these issues and works closely with regulatory agencies to achieve optimal relationships in all communities. US power plant development is subject to extensive federal, state and local laws and regulations, including discharge of emissions into air and water, wetlands, reservations, endangered species, waste disposal, noise, regulations and others. Panda assesses all environmental issues prior to selecting a site.



Gila Bend, AZ 85337-9999

# DEREGULATION OPENED DOOR TO NON-UTILITY POWER PRODUCERS

The door to competition in the electric generation business had been closed since the 1930's with the passage of the Federal Power Act. In 1978, during a time of government-mandated conservation, the Public Utilities Regulatory.Policies Act (PURPA) was passed to allow independent power production only as long as both electricity and other useful energy were available (cogeneration).

The passage of the Energy Policy Act of 1992 opened up the wholesale markets to non-utility generators like Panda to build the most efficient units possible. In 1995, the Federal **Energy Regulatory Commissions** (FERC's) Open-Access Transmission rule (Order 888) allowed equal access to transmission wires by all. Then two final elements occurred, state deregulation and customer choice. At the state level for example in Arizona, customers will soon be allowed to chose their generation suppliers. This is great news for the consumer and will drive energy costs down over time.

> Bulk Rate Postage PAID Gila Bend, AZ Permit No.3

Postal Customer Gila Bend, AZ 85337 For Immediate Release HOLD FOR RELEASE

October 19, 1999

### Panda Energy Plans Merchant Power Plant for Gila Bend

Clean natural gas-fueled unit will add needed capacity for Arizona

DALLAS (10/19/99) Panda Energy International plans to construct a 2,000-megawatt power generating plant, Panda Gila River, L.P., which will provide timely new capacity to meet rising energy demands in Arizona and the desert southwest. To be located three miles northeast of Gila Bend in Maricopa County and 75 miles southwest of Phoenix, this site has been under study for over two years.

The announcement by Dallas-based Panda, one of the nation's leaders in the development of a new breed of clean and efficient merchant power plants, comes in the wake of unusual population growth and demand in the region.

Garry Hubbard, senior vice president for Panda, said "we are excited to add this quality 2,000MW facility to our already existing 9,000MW portfolio of merchant plant projects in development and are pleased to be a part of the rapidly expanding Arizona market."

Jeff Schroeter, vice president of merchant strategies for Panda, said the proposed facility will use the most advanced technology available today.

"We have confirmed the purchase order for GE turbines and have secured the water and land necessary for the project. The plant's cooling system will use less water from the aquifer than was previously used for farming on the plant site," he said.

"The citizens of Arizona are beginning to see the real benefits of electric deregulation," said Speaker of the Arizona House Representatives, Jeff Groscost, R-Mesa. "This plant promises to be environmentally safe, create good jobs in rural Arizona, and produce competitive low-priced electric power."

## PANDA GILA RIVER, L.P. 🚱

Chuck L. Turner, mayor of Gila Bend, said Panda's entry into Maricopa County and the Gila Bend community "is a wonderful boon to our economy. We pride ourselves on this community and know that Panda is going to be a great addition to our growth and development."

Steve Marshall, superintendent of schools, said Panda's plant would be beneficial for residents of our community by providing construction jobs and employment after the project is built.

"This plant would also provide a needed tax base for our school district for improving facilities on our campus. Students would benefit by a developing partnership with the school to put students in touch with on the job technology," he said.

Marshall continued, "by working together, I can see the community, the school district and Panda developing a win-win situation. We look forward to working with Panda in a positive way for the good of our community."

Ed McDaniel, director of project management for Panda, said "the plant is expected to begin construction in September 2000 and be ready for the first phase of operation in June 2002. Approximately 450 jobs will be created during construction with an estimated payroll of \$50 million. During normal operation, about 60 full time jobs will be created."

During construction, the Gila River project will purchase \$10-\$15 million in local materials and services. Once operation has begun, \$5-\$8 million in local purchases will be made each year. The Panda project will contribute approximately \$2-3 million in taxes to the community and schools.

Panda Energy has additional plants in development near Tulsa, Oklahoma; El Dorado, Arkansas; Allentown, Pennsylvania, and Port St. Lucie and Leesburg, Florida. Construction has just commenced in Guadalupe County, Texas, on a 1000MW power plant. The company already operates plants in Roanoke Rapids, North Carolina and Brandywine, Maryland. The Brandywine plant provides nearly 10 percent of the base load power to the nation's capital.

Further details are available on Panda's website at pandaenergy.com.

-30-

Contacts:

Peggy Striegel Striegel & Associates Public Relations (918) 258-3536 1-800-663-1136 ps@striegela.com

### Town of Gila Bend Special Events and Community Announcements

- 1. Due to the Thanksgiving Holiday there will be NO TRASH PICK-UP ON THANKSGIVING DAY, Thursday November 25, 1999. If your trash is normally picked up on Thursdays your trash will be picked up on Friday, November 26 If your Trash is Normally picked up on Fridays your trash will be picked up on Saturday, November 27. Normal pick-up dates will resume on the following Monday.
- 2. The Town Offices and the Community Center will be closed on the following days during the month of November:
  - a. November 11, 1999 In Observance of Veterans Day
  - b. November 25 & 26, 1999 for the Thanksgiving Holiday
- 3. Please remember to vote in the special election to be held on November 2, 1999 in the Town Council Chambers from 6:00 a.m. thru 7:00 p.m. Town residents are being asked to give the Town authorization to potentially borrow money from the Greater Arizona Development Authority (GADA) in an amount not to exceed \$400,000.
- 4. Please note the following dates and times of meetings and events of interest to the residents of Gila Bend:
  - a. Power Plant open house Thursday November 4<sup>th</sup> at 5:30 P.M. at Town Hall. Representatives of one of the proposed power plants will provide snacks and make a presentation concerning the future placement of a power plant in Gila Bend and its effects on the community.
  - b. Painted Rock Reservoir Thursday November 4<sup>th</sup> at 12:00 in the town museum during the monthly Chamber Meeting. Discussion of re-opening the Painted Rock Reservoir to recreational activities. Representatives from all concerned will be on hand.
  - c. Cable TV Public Hearing on Franchise renewal Tuesday November 9<sup>th</sup> during regularly scheduled council meeting. Representatives of Cable-America will be on hand to listen to complaints and problems from the residents of Gila Bend concerning their cable service. Renewal of Cable-Americas franchise license is at issue.
  - d. Open House by Citizens Communications concerning the departure of US West Communications - Wednesday November 17<sup>th</sup> in the school cafeteria. Representatives of Citizens Communications will discuss and answer questions concerning their take over of telephone services in the Gila Bend area from US West.

# Gila Bend gets 2nd power plant

# Work to begin late next year

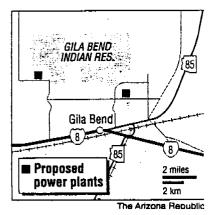
By Max Jarman The Arizona Republic

A second major power plant project has been announced near the small community of Gila Bend, about 50 miles southwest of Phoenix as the crow flies.

Dallas-based Panda Energy International said Wednesday that it would build a \$400 million-plus, gas-fired power plant three miles northeast of Gila Bend that would light about 1 million homes.

Panda's plans come less than a week after last Thursday's announcement of a joint venture between Power Development Enterprises of Dallas and Industrial Power Technology of Santa Rosa, Calif., to build a 750-megawatt, \$400 million power plant six miles northwest of the 2,000-population community.

"We're really excited about the economic impact this will have on the area," Gila Bend Mayor Chuck Turner said. "This is going to be a big boost to the community."



Turner estimated that the additional property taxes generated by the two plants would triple the town's \$1.7 million annual budget and have a similar effect on the \$2 million in tax dollars the Gila Bend Unified

School District takes in each year.

"These are going to be good projects for us," said Steve Marshall, Gila Bend's superintendent of schools. Marshall adde! the district also is excited about the prospect of partnering with the plant developers to obtain additional programs and equipment.

-- Please see GLA, Page D2

# Gila Bend getting second power plant

- GILA, from Page DI

Construction is expected to begin on the Panda plant in late 2000, with a first phase coming on line in the middle of 2002 and completion by the end of 2003.

The Power Development Enterprises project is expected to begin by late 2001, with completion set for early 2004

Combined, the two projects are expected to create about 800 jobs in the area during the construction phase and about 100 permanent positions once the plants are operating.

"That's going to be a big boost for our businesses," Turner said.

Like the earlier announced Power

Development project, the Panda plant will be a merchant facility, generating electricity for sale to wholesale customers.

The Panda plant is the fourth facility slated for the area between Buckeye and Gila Bend and the eighth natural-gas-fired plant to be announced in Arizona in the past year. Last month, Pinnacle West Capital Corp and Duke Energy Corp announced plans for separate natural-gas-powered plants, valued at \$1 billion and \$250 million respectively, for a general area west of Palo Verde.

Besides the four plants planned for western Maricopa County, Pinnacle West has a gas-fired plant planned for west Phoenix, and the Salt River Project has a similar project slated for Tempe. Other plants are proposed for Casa Grande, Kingman and a site on the Fort Mojave Reservation 28 miles southeast of Bullhead City.

The proposed plants reflect an increasingly competitive electricity industry where newer, more efficient operations will have an edge. The natural-gas-fired facilities are thought to be 30 percent to 40 percent more efficient than traditional coal-fired plants.

Ed McDaniel, Panda Energy's project director, said the company was drawn to Gila Bend because of the availability of land and water and

its proximity to a major natural gas pipeline and the Palo Verde switch yard 25 miles to the north.

The switch yard provides a link to the Western Power Grid that delivers electricity throughout 17 Western states. Both the Panda Energy and Power Development projects include construction of separate transmission lines to the switch yard.

McDaniel pointed out the fact that the area is under no Environmental Protection Agency emissions restrictions contributed to the decision to locate near Gila Bend, as did the receptiveness of the community.

Max Jarman can be reached at (602) 444-7351 or at max.jarman@pni.com.

# Panda Energy Plans Generating Plant in Glla Bend

DALLAS (10/19/99) Panda Energy International plans to construct a 2,000 megawatt power generating plant, Panda Gila River, L.P., which will provide timely new capacity to meet rising energy demands in Arizona and the desert southwest. To be located three miles northeast of Gila Bend. This site has been under study for over two years.

The announcement by Dallas-based Panda, one of the nation's leaders in the development of a new breed of clean and efficient merchant power plants, comes in the wake of unusual population growth and demand in the region.

Garty Hubbard, senior vice president for Panda, said "we are excited to add this quality 2,000MW facility to our already existing 9,-000MW portfolio of merchant plant projects in development and are pleased to be a part of the rapidly expanding Arizona market."

president of merchant strategies for Panda, said the proposed facility will use the most advanced technology available today.

"We have confirmed the purchase order for GE turbines and have secured the water and land necessary for the project. The plant's cooling system will use less water from the aquifer than was previously used for farming on the plant site," he said.

"The citizens of Arizona are beginning to see the real benefits of electric deregulation," said Speaker of the Arizona House Representatives, Jeff Groscost, Mesa. "This plant promises to be environmentally safe, create

good jobs in rural Arizona. and produce competitive low-priced electric power."

Chuck L. Turner, mayor Jeff Schroeter, vice of Gila Bend, said Panda's entry into Maricopa County and the Gila Bend community "is a wonderful boon to our economy. We pride ourselves on this community and know that Panda is going to be a great addition to our growth and develop-

> Steve Marshall, superintendent of schools, said Panda's plant would be beneficial for residents of our community by providing construction jobs and employment after the project is

"This plant would also provide a needed tax base for our school district for improving facilities on our campus. Students would benefit by a developing partnership with the school to put students in touch with on the job technology,"; he said.

Marshall continued, "by working together, I can see the community, the school district and Panda developing a win-win situation. We look forward to working with Panda in a positive way for the good of our community."

Ed McDaniel, director of project management for Panda, said "the plant is expected to begin construction in September 2000 and be ready for the first phase of operation in June 2002. Approximately 450 jobs will be created during the construction with an estimated payroll of \$50 million. During normal operation, about 60 full-time jobs will be created."

During construction, the Gila River project will purchase \$10-\$15 million in local materials and services. Once operation has begun, \$5-\$8 million in local purchases will be made each year. The Panda project will contribute approximately \$2-3 million in taxes to the community and schools.

Panda Energy has additional plants in development near Tulsa, Oklahoma; El Dorado, Arkansas; Allentown, Pennsylvania, and Port St. Lucie and Leesburg, Florida. Construction has just commenced in Guadalupe County, Texas, on a 1000MW power plant. The company already operates plants in Roanoke Rapids, North Carolina and Brandywine, Maryland. The Brandywine plant provides nearly 10 percent of the base load power to the nation's capital.

An open house will be held in Gila Bend Thursday, November 4 from 5:00 to 8:00 pm at the Town Hall, 644 West Pima.



Jeffrey W Schroeter, Vice President-Merchant Plant Development (left) and T. Edward McDaniel, Project Director (right) pose with Mayor Chuck Turner during a break in the Council Workshop Tuesday night.

Jeff and Ed made a short presentation to the Council to introduce themselves, their company and their plans for the Gila Bend area with the building of an energy efficient natural gas fired electricity generating station.

Complete details about the plant and a time to visit with those in charge will be available at an Open House to be held in the Ginny Blue Council Chambers on Thursday, November 4.

# Deregulation spurs rush to build power plants

### 1st facilities to find permits easier to get

By Max Jarman The Arizona Republic

First it was Wal-Mart stores; now it's multimillion-dollar electric-power plants that are sprouting up all around the state.

In the past 18 months, plans for 11 Arizona power plants, collec-

tively valued at more than \$4 billion, have been announced.

They range from a \$275 million facility on the Fort Mohave Indian Reservation near Bullhead City to a \$1 billion plant about a mile south of the Palo Verde Nuclear Generating Station, west of Phoenix.

Their proponents are racing to be the first to supply a huge perceived pent-up demand for inexpensive electricity and to get in under current air-quality regulations.

Al Brown, director of the Maricopa Maricopa County Environmental Services Department,

explained that the first plant to apply for an air-quality permit will have a much easier time than those that follow.

Brown said that the first applicant will be dealing with a relatively pollution-free environment. The others will have to take into consideration the assumed pollution of previous applicants.

"The earlier someone gets in, the easier it is," he said.

Collectively, the projects will produce enough electricity to light 4 million homes and create at least 3,500 construction jobs while they

are being built. They will be economic boons to the rural areas where most have been proposed, generating scores of full-time jobs and millions of dollars in annual property tax revenues for local governments and schools.

What's driving the rush to construct power plants is a deregulating electric industry, where customers can buy power from a variety of suppliers instead of one regulated utility. Under such a scenario, companies with the cheapest power will have the edge. And in Arizona those will be the owners of the new

power plants.

Most of the proposed facilities are merchant plants that will produce electricity for wholesale customers instead of end users. They employ state-of-the-art natural gas turbines that according to H. Max Shilstone, a spokesman for Duke Energy North America, are 30 to 40 percent more efficient than traditional coal or oil generators. Once completed, the facilities can be operated with crew of only 20 to 30 people, Shilstone said.

Duke Energy has proposed a \$250 million plant 15 miles south of

Buckeye

Besides costing less to operate, the combined-cycle gas plants cost less to build than traditional coal or nuclear plants and take less time to construct (typically less than two years).

The facilities utilize a natural gas-powered turbine similar to a jet engine to power an electric generator. The hot exhaust from the turbine is then used to heat water to power a secondary turbine, hence the term combined cycle.

- Please see DERECULATION, Page D5

### Deregulation brings flood of plans for facilities

-- DEREGULATION, from Page D1

Shilstone said his company and others are being drawn to Arizona and the Southwest because of the area's robust growth and burgeoning demand for power. Some of the highest electric rates in the country also are a factor.

The average Arizona customer paid \$1,052 for electricity in 1998, according to the Edison Electric Institute, a Washington, D.C.-based a trade association for investorowner electric utilities such as Arizona Public Service Co. While some states had rates higher than the 8.73 cents per kilowatt hour paid by Arizona residents, consumption levels produced the fourth highest annual bills in the country. Only consumers in Texas, Louisiana and South Carolina had higher average annual electric expenses.

Arizona's 8.73 cents per kilowatt hour rate was slightly higher than the national average of 8.26 cents, but significantly more than states such as Idaho, Washington and Oregon where residents pay 5.28 cents, 4.88 cents and 5.79 cents respectively, largely due to the availability of inexpensive hydropower.

But Arizona rates are still below California, where residential customers paid 10.56 cents per kilowatt hour for electricity. That's the market the new plant operators are most interested in and thanks to the Western Power Grid transmission lines that run through the Western part of the state, it's a market that's readily accessible.

"There is an opportunity for these plants to be very profitable," said Tom Owen, an Edison Electric Institute spokesman.

The ability to tap into the grid is a major consideration in selecting a location for a plant, according to Shilstone. His company is among five that have announced plants in western Maricopa County, largely because of its proximity to the Palo Verde switchyard and the power grid that serves 17 Western states.

The availability of natural gas and water also is a consideration as is the ability to put pollutants into the atmosphere.

A 500 megawatt plant will consume about 6,000 acre-feet of water per year. That's enough to irrigate 1,500 acres of cotton and the amount of Central Arizona Project water the Hopi Indian community is seeking for 12,000 residents.

Although the new plants are significantly cleaner than traditional coal or oil plants, they are still classified as major sources of pollution because they emit more that 100 tons of nitrogen oxides per

year. Nitrogen oxides are the plants' principal pollutants and are a leading contributor to ozone pollution.

Duke Energy's proposed 500 megawart plant, for example, is expected to emit about 220 tons of nitrogen oxides per year. Pinnacle West Capital Corp.'s 2,120 megawart plant planned near Palo Verde Nuclear Generating Station, will emit 1,176 tons of nitrogen oxides per year.

Other pollutants from the natural gas plants include carbon monoxide, particulates, volatile organic compounds and oxides of sulphur.

In eastern Maricopa County, which has been classified as a non-attainment area, proponents of three new plants will have to produce offsets for 120 percent of the new emissions. The offsets could be obtained by reducing emissions at other facilities, or by purchasing them from other companies.

That's not yet the case for the five facilities planned for western Maricopa County. The area is still an air pollution attainment area and new polluters have to prove only that the developments won't lead to significant deterioration of the area's air quality.

That will easier for the first applicants and increasingly more difficult for those that follow. Brown said his department is concerned about the impact of all the new plants — both on the environment and on the department.

"It's going to be a huge amount of work to evaluate all these proposals," he said.

But there are benefits.

Donald Van Brundt, executive director of the Mohave County Economic Development authority, estimates the Griffith Energy plant going up eight miles south of Kingman, will contribute \$4.5 million per year in personal property and real estate taxes. Van Brundt said more than 70 percent of the amount will go to the area's schools.

"The major beneficiary is education," he said.

Besides the jobs — 350 during the two-year construction phase and 25 to 30 relatively high-paying permanent positions after it is completed — the plant will offer a reliable source of inexpensive electricity, which Van Brundt plans to use to lure other industries to the area.

The lack of electric power generation in the area has held back our industrial growth for many years," he said. "That's about to change."

Mex Jarman can be reached at (602) 444-7351 or at max.jarman@pni.com.

### Proposed power plants around the state

1. GRIFFITH ENERGY PROJECT Location: 8 miles south of Kingman.

Size: 520 megawatts.
Cost: \$275 million.
Developer: Duke Energy North
America and Griffith Energy/Summit
Group International.
Status: Construction began in October.

DESERT BASIN POWER PLANT Location: Casa Grande.

Size: 500 megawatts.
Cost: \$260 million.
Developer: Reliant Energy.
Status: Construction is scheduled to begin this winter.

3. SOUTH POINT POWER PLANT Location: 28 miles south of Buil-

head City.
Size: 500 megawatts.
Cost: \$275 million.
Developer: Calpine Corp.
Status: Construction is scheduled to begin next month.

4. KYRENE GENERATING STATION Location: 7005 S. Kyrene Road, Tempe.



Size: 825 megawatts.
Cost: \$400 million (est).
Developer: Salt River Project, Dynegy Inc. and NRG Energy Inc.
Status: Construction is scheduled to begin late next year.

5. SANTAN GENERATING STATION Location: 1005 S. Val Vista Drive, Gilbert.

Size: 825 megawatts. Cost: \$400 million. Developer: Salt River Project. Status: Long range project.

6. 43rd AVENUE PLANT
Location: 43rd Avenue and Buckeye Road, Phoenix.

Size: 500 megawatts. Cost: \$220 million. Developer: Pinnacle West Capital Corp. and Calpine Corp.

Status: Construction is scheduled to begin early next year.

7. RED HAWK PLANT

Location: 1 mile south of Palo Verde Nuclear Generating Station. Size: 2,120 megawatts. Cost: \$1 billion. Developer: Pinnacle West Capital Com.

Status: Construction is scheduled to begin in late 2000.

8. ARLINGTON VALLEY PLANT Location: 15 miles southwest of

Buckeye. Size: 500 megawatts. Cost: \$250 million. Developer: Duke Energy North America.

Status: Construction is scheduled to begin early in 2001.

### 9. HARQUAHALA GENERATING STATION

Location: West of Wintersburg.
Size: 1,000 megawatts.
Cost: \$400 million.
Developer: PG&E Energy Services.
Status: Construction to begin in late
2000.

### 10, GILA BEND GENERATING STATION

Location: 6 miles northwest of Glia Bend, Size: 750 megawatts.

Cost: \$400 million.
Developer: Power Development Enterprises and Industrial Power Technology.

Status: Construction is scheduled to begin in late 2001.

### 11. GILA RIVER PLANT

Location: 3 miles northeast of Glia Bend. Size: 2,000 megawatts.

Cost: \$500 million to \$1 billion (est).
Developer: Panda Energy Interna-

tional.
Status: Construction is scheduled to begin in late 2000.

# Gila Bend predicts boom, not gloom ahead for town

By Mark Shaffer

The Arizona Republic

Gila Bend

It's been characterized over the years as the fan belt capital of the United States, the industrial waste capital of Arizona and the scrap metal king of Maricopa County.

Twisted wreckage from abandoned autos, trailers and appliances litters the edges of town. Hundreds of tons of spent military munitions are scattered along Arizona 85 on the vay south to Mexico.

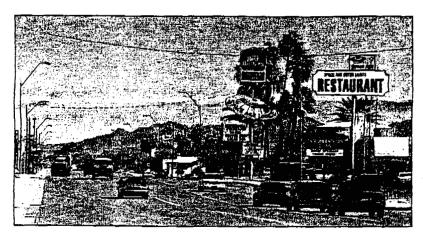
On top of that, Gila Bend has been that real rarity in Arizona, a town losing population. It has shrunk 25 percent since the early 1960s—to 1,700 brave souls.

But when Town Manager Carl Stephani starts talking about Gila Bend, he sees boom, not gloom. Let us take care of the excessively high fluoride in the drinking water and the excessive effluent in the wastewater during the next six months and watch out, Stephani says.

The town will become much more than Valley travelers' first pit stop on the way to San Diego or Rocky Point.

To wit:

- Two major energy companies announced last month that they will build power plants within six miles of Gila Bend. Those will bring 800 construction jobs and are expected to triple the budget of the town and local school district.
- Maricopa County will complete its paving of Arizona 238 between Mobile and Gila Bend in mid-November, cutting 15 miles off the distance to the southeast Valley. The Arizona Department of Transportation has accelerated its plans to make Arizona 85 four lanes between Buckeye and Gila Bend because of a



What once was a thrivin main street i. now quiet. Gila Bend ha been that rea rarity in Arizona, a town losing population. It has shrunk 2 percent since the early 1960s - to 1,700 brave souls.

series of fatal accidents on the two-lane road.

- The town has been approached by seven subdivision developers over the past few months. There's keen interest in developing land west of town, which is being sold off by the 100,000-acre Paloma Ranch.
- Grant money has been pouring into town to build a new water well and airport taxiway and improve the wastewater treatment plant and other smaller infrastructure projects.

Stephani left good municipal planning jobs in the Valley two years ago to come to Gila Bend because "this is the next place that's going to happen."

"This is going to be the next major retirement area in the state," Stephani said.

James Bourey, executive director of the Maricopa Association of Governments, seconds that notion.



The Arizona Republic

-- Please see GILA BEND, Page B2

# Gila Bend officials see boom, not gloom, in future

- GILA BEND, from Page B1

"Clearly, with the power plants and the increased access to town, there's a significant impetus for development. Plus, you already have one developer who has purchased a large tract of land," Bourey said. "I suspect that in five years, you will see a lot development there."

For now, Mayor Chuck Turner would just like to see a chain supermarket, local pharmacy and bowling alley. It would also be exceedingly cool if Denny's would finally put in the restaurant that's been talked about for a

long time.

Turner harks back to the glory days of the '60s when the Air Force base south of town was thriving and Gila Bend had 25 motels and 22 gas stations. The base later closed and Interstate 8 bypassed downtown.

"There's little doubt now that we are on the move," Turner said. "In addition to the retirees, I also see this becoming an excellent bedroom community for the Val-

ley."

Talk like that makes lifelong resident Geneva Pino, 26, a liquor-store clerk, roll her eyes. She waves at passing pickup trucks from the stoop of her elevated loading dock.

"There's always a lot of talk that things will happen here. But I've seen some businesses come and a lot more of them go," Pino

said.

But times have changed, said Patricia Willoughby, who operates a beauty salon and is definitely bullish on Gila Bend. "It's quiet, clean and friendly, and it's real easy to know where your kids are," Willoughby said. "But the main thing is we were paying \$700 a month for a little house in Cave Creek and moved here three years ago and rented the same size house for \$300 with 10 acres of land along with it."

Carole Fox, co-owner of the Space Age Lodge, remains skeptical but hopeful. She is keenly aware of all the water miseries in the town's past, including pumping 107-degree water from just

below the surface to her establishment. She said it forced her to put up signs warning customers about the overheated water.

"We all get tired of being the butt of jokes and being the low man on the totem pole," Fox said. "But there are promising signs now, jobs from the prison between here and Buckeye and the power plants coming in. When we get the infrastructure

in, then we can start talking seriously."

Stephani has been a workhorse

in that regard.

Stephani has also embarked on development relating to tourism in the area. He's focusing on redevelopment of the Stout Hotel, a classic, historic building built by the same company that built the Hassayampa Inn in Prescott.

"We are going to be the next

small town you would want to live in and only an hour from downtown Phoenix," Stephani said.

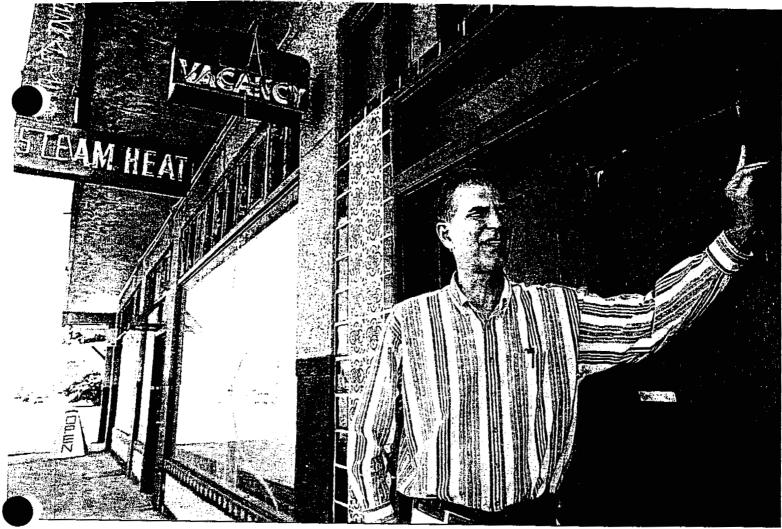
Mark Shaffer can be reached at (602) 444-8057 or at mark.shaffer@pni.com.

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We all get tired of being the butt of jokes and being the low man on the totem pole. But there are promising signs now, jobs from the prison between here and Buckeye and the power plants coming in. When we get the infrastructure in, then we can start talking seriously.

### CAROLE FOX

CO-OWNER, SPACE AGE LODGE



Photos by Tim Koors/The Arizona Republic

When Town Manager Carl Stephani starts talking about Gila Bend, he sees boom times ahead. The town will become much more than Valley travelers' first pit stop on the way to San Diego or Rocky Point, Stephani says, with power plant jobs and with developments providing homes for retirees.



Tim Koors/The Anzona Republic Patricia Willoughby, who operates a beauty salon in Gila Bend, is definitely bullish on the town, "It's quiet, clean and friendly, and it's real easy to know where your kids are," she says.

### **BACKGROUND**

### Gila Bend facts and figures

#### **Population**

1997	1.735
1996	1,730
1995	1.747
1990	1.747
1985	1,999
1980	1.585
1970	1.795
1965	1.938
1962	2.132
1960	1.813

### Area within town limits

21 square miles.

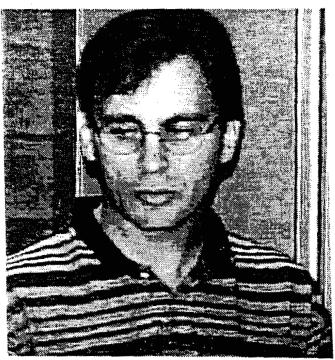
### History

1699 — First farms in area established by Jesuit missionary Father Eusebio Kino.

1851 - Infamous Oatman massacre happens west of town. All but three children of westbound family killed by

Gila Bend was was settled as main stop on the Butterfield Stage route.

## Ed of Panda Energy At Rotary Monday



### Edward McDaniel

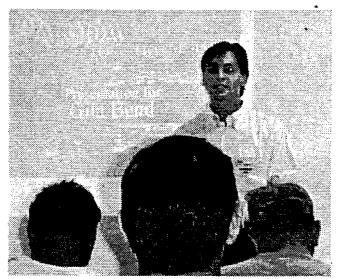
Mr. Edward McDaniel was the guest of Rotary President at Monday's meeting. Mr. McDaniel had attended a Rotary meeting in Gila Bend some six years ago and had a copy of the Gila Bend Sun to prove it. At that time he was a field engineer for APS and they were looking at locating a free standing automated electric generating plant in this area.

Now Ed is Project Director for Panda Energy International, Inc., a company that is planning to build a 2,000 megawatt natural gas fired electric generating station north of Gila Bend.

Panda Energy will be holding an Open House at the Ginny Blue Council Chambers Thursday, November 4 from 5:00 to 8:00 pm. At this Open House Panda will have displays about the planned facility and Ed and other members of the firm will be on hand to talk to people of Gila Bend, answer questions and give information about the project.

The official "presentation" will be made at 6:00 pm. But residents are invited to arrive at 5:00 so as to get better acquainted with Ed and his fellow "Pandas."

## PANDA ENERGY OPEN HOUSE



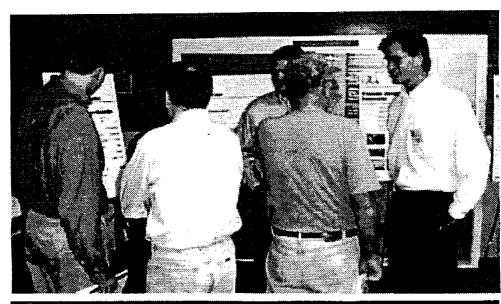


Panda Energy held an open house at the Town Office on Thursday, November 4. They set up story boards about the power project, maps pinpointing the area where the plant will sit, although an exact location on the property has not been established and plenty of Panda Personnel to answer questions and give out information to the 40 or so people present.

Above, Ed McDaniel Project director helped with the formal presentation and slide show given in the Council Chambers. He also introduced Mr. Carter, son of one of the owners as well as other members of the staff.

The "Merchant Power Plant" will be powered by natural gas that will be routed to Gila Bend from the main line that crosses the Gila River at the Gillespie Bridge. Natural gas is the fuel of choice at this time, with reports that the supply is plentiful.

Panda has also been measuring the noise level at the area of the proposed site. A train produced the highest level of noise during the time the measurements were being taken.







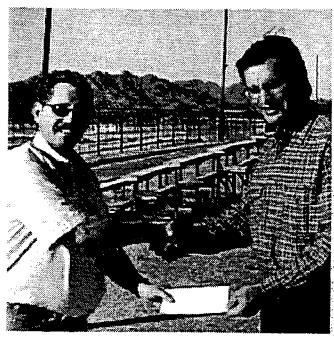
# From The Town Hall

by Mayor Chuck Turner

### **Panda Open House**

For those of you that may have missed the Open House at Town Hall last week, sponsored by Panda Development, you missed a very informative meeting. There were approximately 35 to 40 people in attendance. Most, had lots of questions as to the benefits as well as the down sides to having a natural gas powered electrical generator in the community. With much technical data available, and experts to answer questions, this proved to be very educational for all.

I talked to the representatives from Power Development Enterprises Inc. (the first project to express interest in Gila Bend) on Monday and they are continuing to move forward on their project. The annexation to include their gas powered turbine generators into the town proper is continuing. An interesting side bar to all this new commercial economic development, there were four home developers in attendance verifying what they had read in the Arizona Republic as to the potential growth of Gila Bend. In talking to them they were very exited about future development in the town.



Ralph Walls, Gila Bend Chamber of Commerce President (left) accepts a check from Edward McDaniel, Project Director for Panda Gila River L.P. in the amount of \$2,500.00. The letter that accompanied the check reads in part:

"On behalf of Panda Energy International and our 150 plus employees and families, we are proud to contribute \$2,500 to the Saddle Roping Event for Katelyn Carpenter.

"Our hearts go out to Katelyn and her family as we share with Gila Bend your spirit of helping each other in times of need.

"Panda feels privileged to belong to such a warm and close community and will keep Katelyn in our prayers."

The Saddle Roping Event will be held at the Rodeo Grounds in Gila Bend on December 5, 1999. Everyone is invited to attend. There is no admission charge. See complete details on page 10.

The Panda Company is currently planning an electrical power generating facility to be built just, north of Gila Bend along the Gila River.

### EXHIBIT J-2 MEETING MATERIALS

### GILA BEND TOWN COUNCIL MEETING, TUESDAY, OCTOBER 19, 1999

### **Meeting Summary**

The project was placed on the agenda as a discussion item for the Gila Bend Town Council. The Applicant provided a presentation and overview of the project and the Applicant. The merchant plant process and the combined cycle process were among the items under discussion. In addition to the representatives from the Town, between 10 and 15 members of the public were in attendance. Questions from the public related to:

- job creation
- noise
- impacts to air or water

### PUBLIC OPEN HOUSE, THURSDAY, NOVEMBER 4, 1999

### **Meeting Summary**

The meeting consisted of an open house that was held from 5:00 pm to 8:00 pm and a 6:00 pm presentation in Gila Bend, Arizona. Representatives from the Applicant, environmental consultants to the Applicant, and a Spanish interpreter were available to answer questions. A total of approximately 40 people attended the meeting, which was announced via media release, an October 21, 1999 ad in the *Gila Bend Sun*, and in newsletters that were delivered to all local postal addresses.

Two written comments were received during the meeting. One was a request for a copy of the hydrology report, and the second commented on the thorough presentation and sincere context of the meeting.

Representatives from the Applicant conducted a presentation at 6:00 pm. Questions from the public followed, and related to the following topics:

- job creation and the Applicant's policy on local hiring and purchasing
- expected lifespan of the plant
- relationship between power plants and small town growth
- water requirements of the plant
- air quality impacts

Attached to this exhibit are a copy of the presentation slides that were presented on November 4, the graphics displayed at the open house, an example of the comment card that was distributed, and a handout map of the site location that was provided.

### NOTICE OF A PUBLIC MEETING

### GILA BEND TOWN COUNCIL October 19,1999; 5:30 p.m. Council Chambers, 644 West Pima Street AMENDED AGENDA

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- A. Call to order
- Pledge of Allegiance B.
- Invocation C.
- 11. **ROLL CALL** 
  - A. Mayor Chuck Turner Vice-Mayor Fred Hull В.
  - Ĉ. Council Member Bill Henry
  - Council Member Stave Holt
- E. Council Member Christopher Riggs
- F. Council Member Richard Stuart
- Council Member James "Bud" Turner G.
- WORK SESSION (the Council may not take action on this project because it is on 111. the agenda for discussion only) - Maricopa County Flood Control District (MCFCD) Community Area Drainage Master Plan

### RECESS TO ALLOW OPEN CITIZEN/STAFF INTERACTION

IV. WORK SESSION (the Council may not take action on this proposal because it is on the agenda for discussion only) - Panda Gila River, L.P., Proposed Power Plant Development

### **RECESS**

- V. BUSINESS - Consideration and possible action to approve Preliminary Design Drawings for the Martin Street Pedestrian Walkway
  - A. Work Session Discussion
  - B. Consideration and possible action
- VI. EXECUTIVE SESSION: Consideration and possible action to move into Executive Session pursuant to ARS 38-431.03 (A) legal advice regarding annexations and siting agreements

VII. ADJOURNMENT

Carl J. Stephani, Deputy Town Clerk

ACCESSIBILITY FOR ALL PERSONS WITH DISABILITIES WILL BE PROVIDED UPON REQUEST, PLEASE TELEPHONE YOUR ACCOMMODATION REQUEST (683-2255 OR 1-800-367-8939 ADD ARIZONA RELAY SERVICE) 72 HOURS IN ADVANCE IF YOU NEED A SIGN LANGUAGE INTERPRETER OR ALTERNATE MATERIALS FOR A VISUAL OR HEARING IMPAIRMENT.

# You are cordially invited to join us

Thursday, November 4 from 5:00pm to 8:00pm at the Town Hall, 644 West Pima, to learn more about the planned

Panda Gila River, L.P. project to be located 3 miles northeast of

Gila Bend.

Panda Energy will conduct a brief presentation on the project. Local city officials and principals from Environmental Planning Group, Inc. will be present to address



questions and concerns of the community.

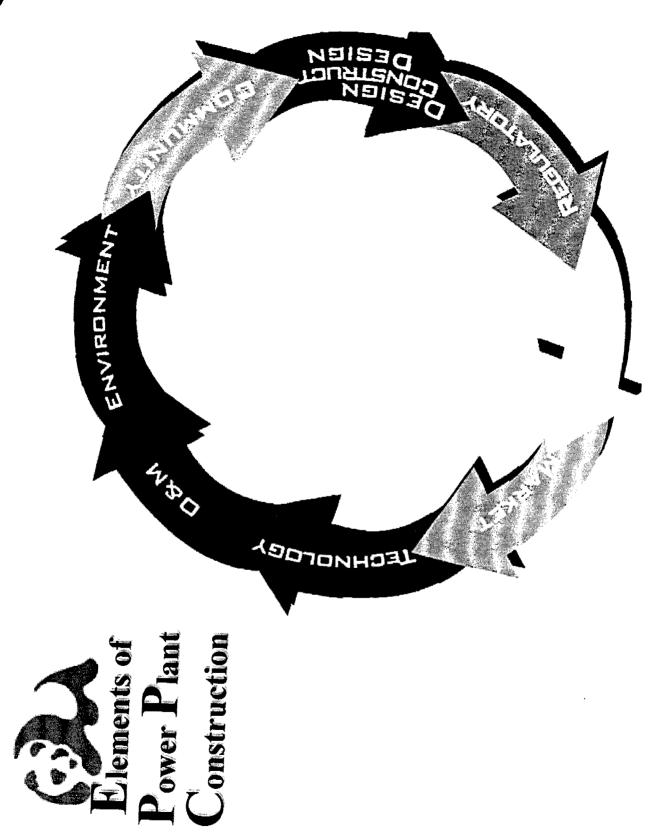
For any questions regarding this meeting, contact T. Edward McDaniel, Project Director at (623) 362-2267.

PRESENTATION SLIDES, November 4, 1999

THE GLOBAL POWER fila Beno Presentat 3

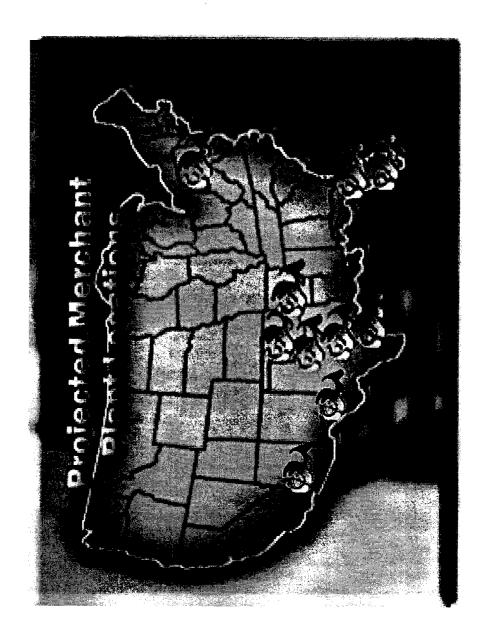


- Founded 1982 and based in Dallas, TX
- Privately held corporation
- 150+ Employees
- Plants in operation: North Carolina, Maryland, China 500 MW
  - Projects under development 9000+ MW
- International offices: China, Nepal and Brazil





# Summary of Projects In U.S.

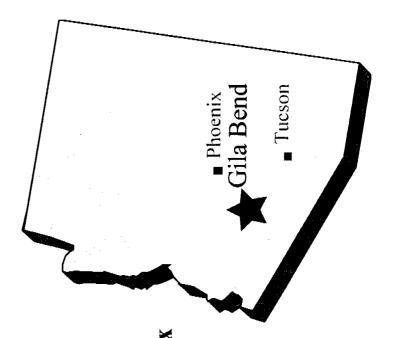


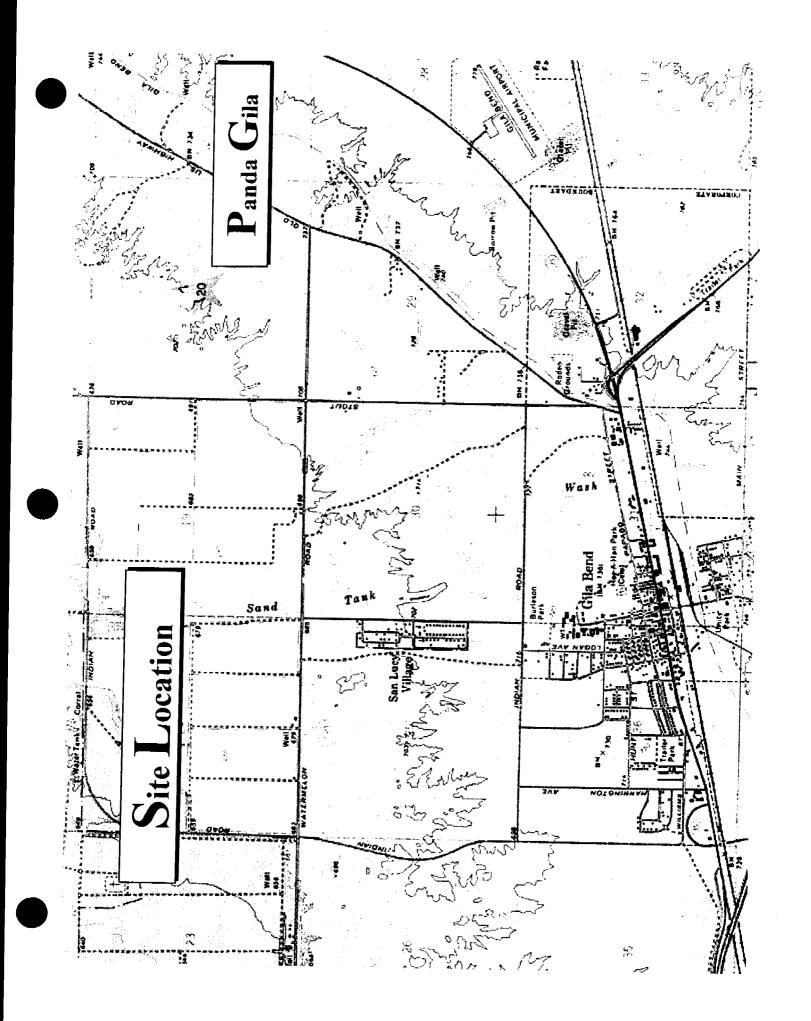


- 2,000 MW combined cycle
- Natural gas fired facility
- High efficiency "F" technology
- · Combustion turbine
- Near Palo Verde hub connection

# Location:

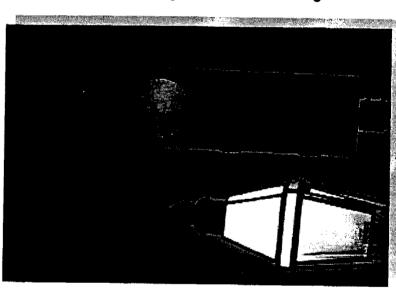
Gila Bend, Arizona
Three miles NE of town
Maricopa County
75 miles Southwest of Phoenix







# Transmission

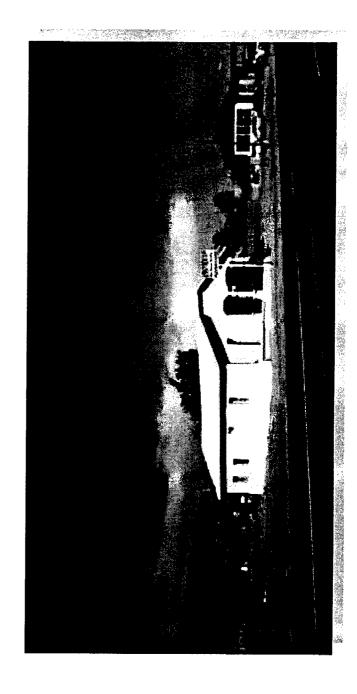


- Panda generates the electricity used at home and in your community.
- It is supplied through your local electric service provider
- Plant will connect with APS, SRP and others



# 

Site is approximately 20 miles from several major natural gas pipelines ensuring an economical and plant by underground pipelines along the roads. reliable supply. Gas will be transported to the







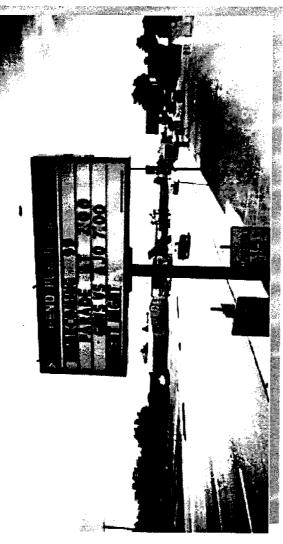
Receptive community

Taxes to local schools and the town

• State development incentives



# Commitment to the Community



- Actively participate in local organizations
- Sponsor local teams and events
- Sponsor educational scholarships
- Provide emergency relief donation
- Be a good neighbor





• 60 permanent on-site \$3 million annual payroll





# Local Purchases.

• \$10-\$15 million in goods and services during construction

• \$5-\$8 million in goods and services each year of operation





• \$2-\$3 million to Gila Bend and the area schools





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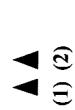
# 2000 666

# 2001

# 2002

# 2003

# Development Milestones



<b>4</b>	$\mathfrak{S}$





Completed

Ordered

12/99



- 1. Site Acquisition
- 2. Long Lead Items (turbines)
- 3. Permit applications submittal
- 4. Permits Approvals Expected
- 5. Financial Closing
- 6. Construction
- 7. Commercial Operation 1st 1000 MWs
- 8. Commercial Operation

2nd 1000 MWs

- 00/6
- 10/00
- 11/00-12/02
- 06/02
- 01/03

**GRAPHICS DISPLAYED AT OPEN HOUSE, November 4, 1999** 



# Panda Gila River Project

Public Open House

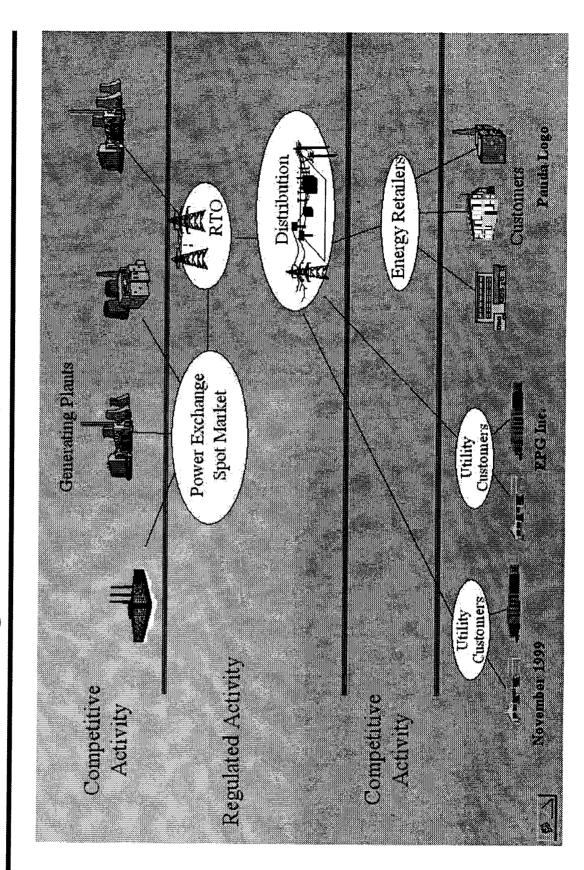
Presentation begins at 6:00 p.m.

**NOVEMBER 1999** 



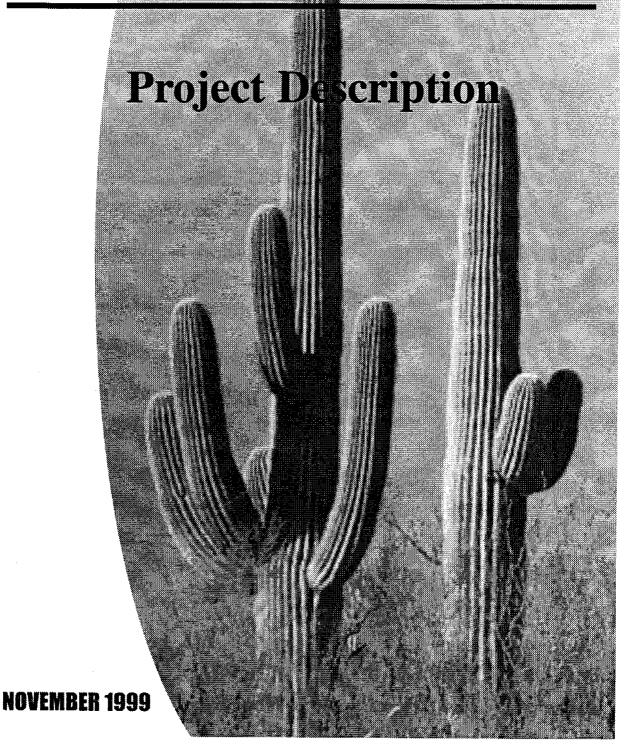
PANDA GILA RIVER PROJECT

# Arizona's competitive electricity market structure





# Panda Gila River Project





# **Project Description**

- 2,000 MW combined cycle
- Natural gas fired facility
- High efficiency "F" technology
- Combustion turbine

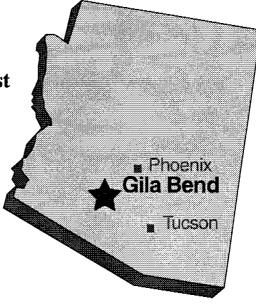
### LOCATION:

Gila Bend, Arizona

3 miles NE of city

**Maricopa County** 

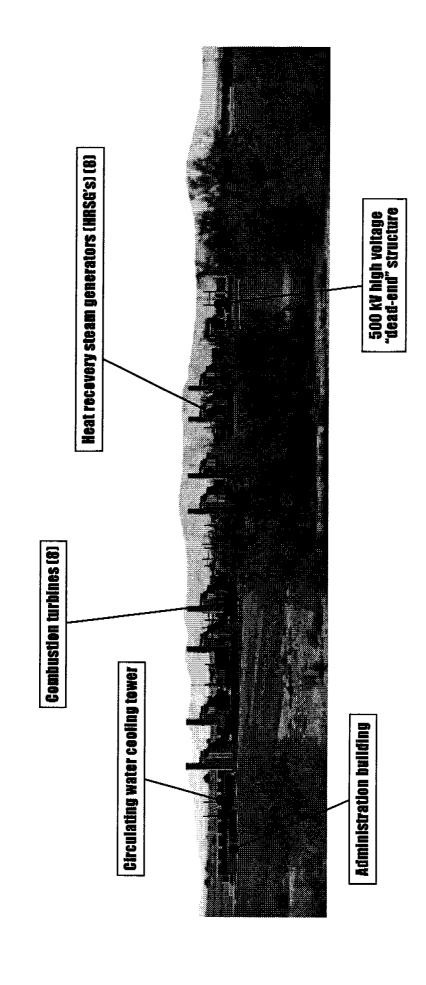
75 miles Southwest of Phoenix





PANDA GILA RIVER PROJECT

# **Artist's rendering example of plant**





## **Panda Gila River Project**

- Site attributes
  - -close to load growth
  - -ample land and water for project
  - existing land buffers
  - near railway and highway for ease of construction
  - proximity to electric and gas sources



PANDA GILA RIVER PROJECT

# **Economic Advantages for the Community**

- 450 construction jobs, \$50 million payroll
- 60 permanent on site jobs,
  \$3 million annual payroll
- \$10 to \$15 million in goods and services during construction



• \$5 to \$8 million in local purchases each year of operation



• \$2 to \$3 million to Gila Bend and the area schools





**NOVEMBER 1999** 



# **Development Milestones**

1999	2000	2001	2002	2003		
A A						
<b>▲ ▲</b> (1) (2)	<b>A</b> (3)	<b>A A</b> (4) (5)	<b>A</b> 161	<b>A</b> (7)	<b>(8)</b>	
	102	(-1)(0)		423	107	
	1	. Site a	ecquisi	tion		Completed
	2	. Long	lead it	tems (tu	rbines)	Ordered
	3	. Perm	it appl	lications	submittal	12/99
	4.	. Perm	it app	rovals e	xpected	9/00
	5.	Finar	ncial cl	osing		10/00
	6.	Cons	tructio	n	· 1	11/00-12/02
4.	7.	Com	mercia	l operat	ion	·
		first 1	1000 M	[Ws		06/02
	8.	Com	mercia	l operat	ion	
		secon	d 1000	MWs		01/03



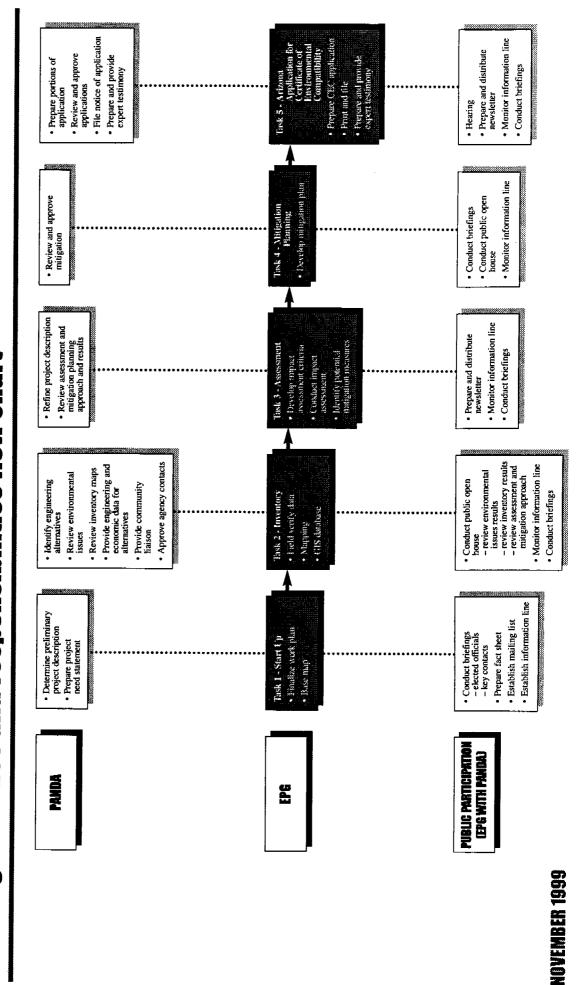
# Panda Gila Rive**r P**roject

Environmental Study and Public Process **NOVEMBER 1999** 



# PANDA GILA RIVER PROJECT

# Planning activities and responsibilities flow chart



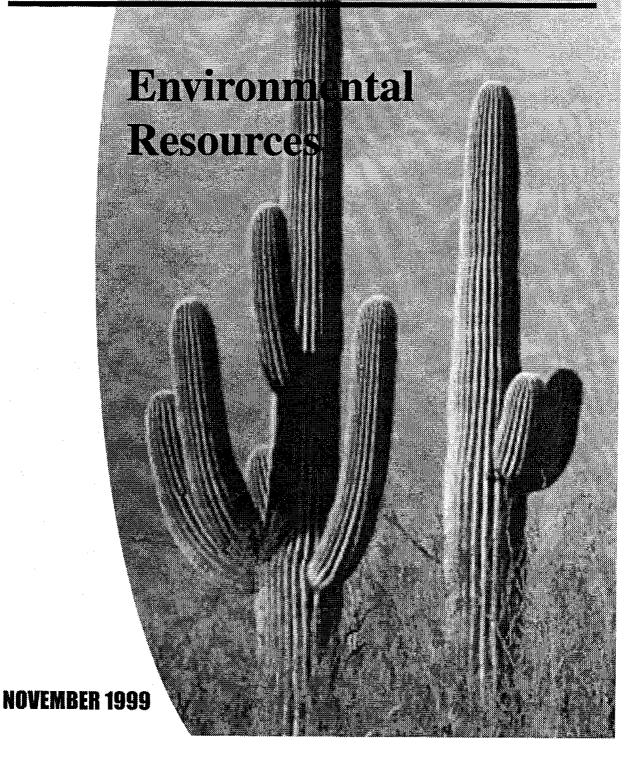


## **Public Participation Activities and Tools**

- Two public open houses
- Agency and other contacts
- Telephone information line
   877-522-9099 Gila Bend area
   602-522-2466 Phoenix area
- Web-site www.pandaenergy.com
- Newsletters
- Comment forms



# Panda Gila Rive**r P**roject





# **Certificate of Environmental Compatibility**

- Scenic resources
- Cultural resources
- Land use
- Recreation
- Biological resources



# **Air Quality**

- · Ambient air quality standards
- Install cleanest technology available
- Conduct analysis using air dispersion model
- PSD permit to include:
  - must determine best available control technology
  - no visible emission
  - no exhaust odors
  - maintain air quality standards
- Public review of PSD permit prior to approval



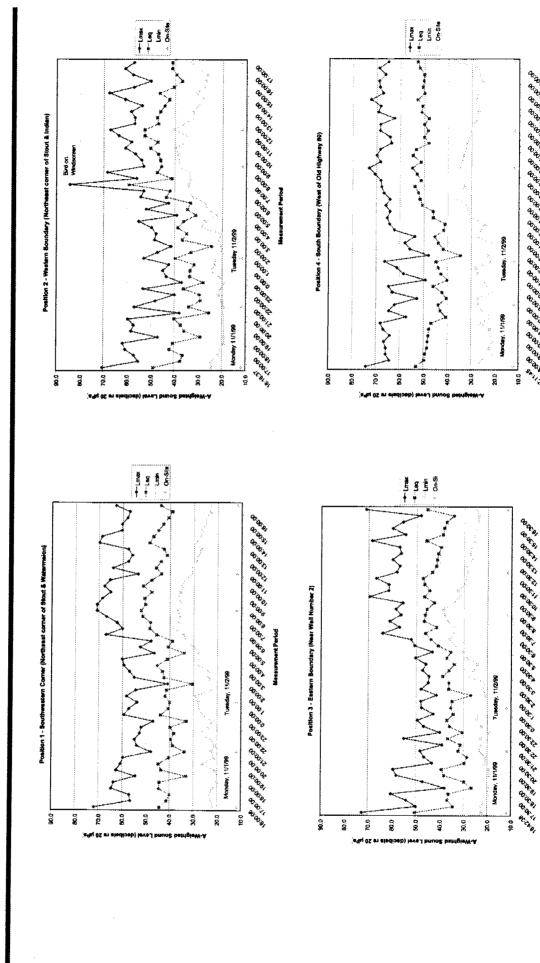
# **Water/Wastewater Discharge**

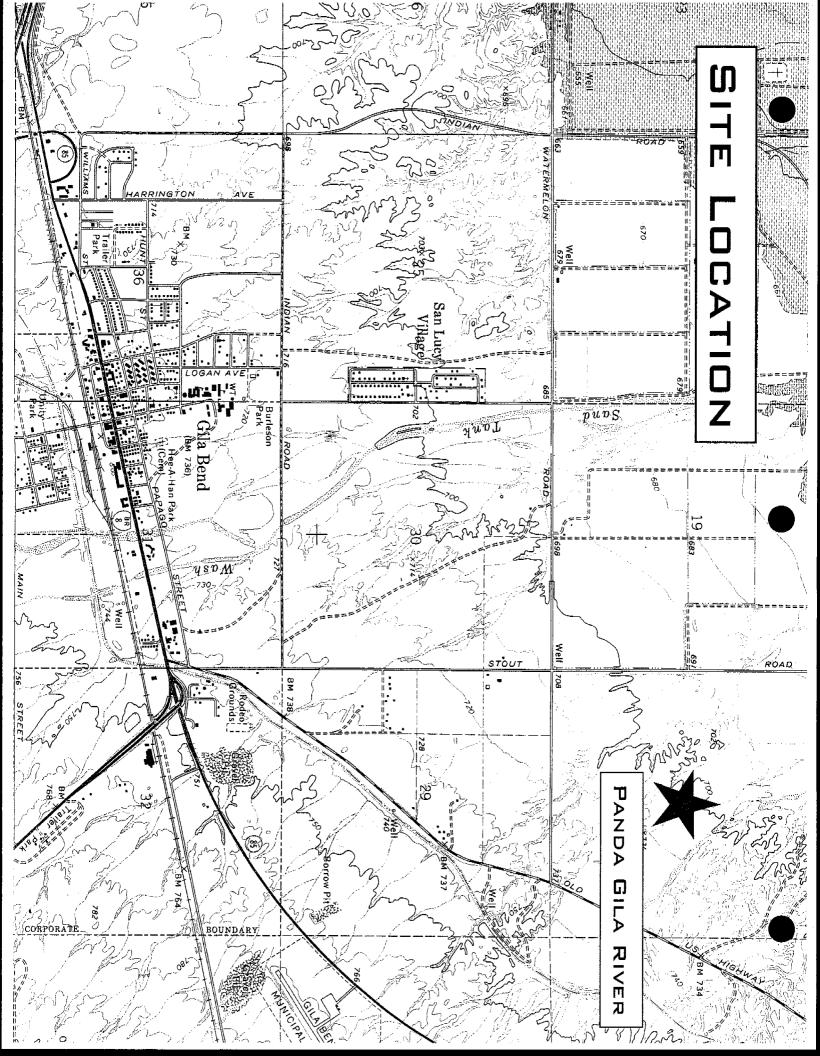
- Wastewater discharge
  - recycle/reuse (on site)
  - -sanitation sewer (city)
- Water supply
  - -ground water (on site)
  - -potable water (city)



# PANDA GILA RIVER PROJECT

# Ambient noise data







COMMITTEES: AGRICULTURE, CHAIRMAN ENVIRONMENT RULES

DISTRICT 15

## 

December 6, 1999

Mr. Edward T. McDaniel Project Director Panda Gila River, LP 4100 Spring Valley Road Suite 1001 Dallas, TX 75244

SUBJECT: 2,000 MW POWER PROJECT IN GILA BEND, AZ

Dear Mr. McDaniel:

Over the past several months I have discussed your planned Power Project north of Gila Bend with your Lobbyist, Tom Wray. He has described the planned regulatory filings you are pursuing, as well as the Power Project's schedule.

We have also discussed the many economic benefits the Power Project is estimated to bring to the local community and our state: 450 jobs during construction; 60 jobs during plant operations; \$10 - \$15 million in local spending during construction; \$5 - \$8 million during operations; and, \$2 - \$3 million in annual taxes to the school district and local community. Such an economic boost would be unprecedented in the history of the Town of Gila Bend.

Beyond this, the Power Plant will be a new, lasting source of very competitive electricity: something essential to attract new businesses to our state.

I will continue my enthusiastic support of the Power Project and stand ready to assist your development efforts where I can.

Sincerely,

MIKE GLEASON State Representative

Mike

MG/ga

# Gila Bend Unified School District #24

HOME OF THE GILA MONSTERS

308 N. Martin Ave. P.O. Box V Gila Bend, AZ 85337 Phn (520) 683-2225 Fax (520) 683-2671

GOVERNING BOARD Brenda Jordan Ralph Vasquez Tony Davis Darah Mann Terri Bowers



E-Mail Address: stevem@gilabend.k-12.az.us

Walt Coker 9-12 Principal

Norma Fergison K-8 Principal December 3, 1999

REGERENCE OF COLUMNIES

To Whom It May Concern:

This is a letter of support for Panda Energy International power plant which is being constructed near the community of Gila Bend Arizona. As Superintendent of Gila Bend Unified School District, I have had the opportunity to talk with both Mr. Ed McDaniel and Mr. Tom Wray regarding the construction of the Panda electrical generating plant. I also attended a Town meeting that was held to give our community more information regarding the plant.

I was impressed that according to Mr. McDaniel and Mr. Wray, the Panda Power Plant would utilize natural gas which is a clean burning fuel and the plant would utilize a closed system to generate electricity.

Such a plant would be a benefit for residents of our community by providing construction jobs and employment after the project is completed. I believe that a plant such as this could also benefit our students by developing a partnership with the school and students to put them in touch with on the job technology for future careers.

By working together, I see the school district and Panda Power developing a positive climate. We look forward to working with Panda Corporation in a positive way for the good of our community.

Marshall

Sincerely,

Mr. Steve Marshall Superintendent



# TOWN OF GILA BEND

The Heart of Arizona

December 16, 1999

RECTO DEU 21 1939

Mr. T. Edward McDaniel Project Manager Panda Energy International, Inc. 4100 Spring Valley, Suite 1001 Dallas, TX 75244

Ref:

Panda Gila River Project Letter of Project Support

Mr. McDaniel:

On behalf of the Town of Gila Bend, Arizona, and our Town Council, I wish to express our strong support for Panda Energy International's proposed power plant in our community. The proposed project will bring jobs for our residents, income to local businesses, and substantial upgrades to our area schools for our children.

Our experience to date has been very but positive with your company. The open house held November 4 was very professionally organized and helped clarify the public's understanding of the power plant project. Panda brought a very complete staff of knowledgeable personnel to answer individual questions. We all look forward to a long and productive relationship together and offer to assist you with permitting at the State level, if necessary, in support of this project.

Yours very truly,

Chuck Turner

Mayor

cc:

Council

### EDWARD J. CIRILLO DISTRICT 15

STATE SENATOR FORTY-FOURTH LEGISLATURE

CAPITOL COMPLEX, SENATE BUILDING PHOENIX, ARIZONA 85007-2890 PHONE (602) 542-4173 TONE (602) 542-352-8404, X4173 FAX (602) 542-3429 E-MAIL etirillo@azieg.state.as.us



## Arizona State Senate

**COMMITTEES:** 

APPROPRIATIONS
FINANCE
FINANCIAL INSTITUTIONS AND
RETIREMENT, Chair
TRANSPORTATION

ETHICS COMMITTEE
JOINT LEGISLATIVE BUDGET COMMITTEE

15 December 1999

Edward T. McDaniel, Project Director Panda Gila River, LP 4100 Spring Valley Rd #1001 Dallas TX 75244

RE: PROPOSED GILA RIVER POWER PROJECT

Dear Mr. McDaniel,

I have received informational briefings on the proposed project planned in the Arizona Town of Gila Bend during the last several months. I also received your press release of October 19 outlining plans and the projected benefits anticipated from the project. Gila Bend is located within District 15.

I have become aware of the broad support of the project by the local citizens of Gila Bend. The creation of jobs and local spending during construction and operations will have a major positive and lasting impact on Gila Bend. The huge contribution the project will make on annual property taxes can surely allow the local school district to solve financial issues and permit improved services for educating the children.

My office is in support of your efforts to make the project a success in Gila Bend. You may contact me if I can be of assistance.

Sincerely

Edward | Cirillo

EJC/tr/hmm

# Gila Bend Chamber of Commerce

P.O. Drawer CC Gila Bend, Arizona 85337 "Where The Sun Spends The Winter"

ે

December 24, 1999

To whom it may concern,

As the President of the Gila Bend Chamber of Commerce, I would like to say that I look forward to Panda Energy coming to Gila Bend, Arizona. Panda will be a benefit to our community by supplying jobs, an increase in revenues for established businesses in Gila Bend and more tax revenues for our schools. I also believe that Panda Energy will be a benefit to the State of Arizona by helping to lower the price of energy. I believe that with different power companies we will have a more competitive market. I look forward to Panda being an active participant in the community of Gila Bend. I also believe that once Panda Energy is under construction that other companies will take a serious look at Gila Bend. If anyone would like to contact me on this subject I would be more than willing to talk about what I believe will be the positive impact that Panda Energy will have on our community, my work phone number is 1-520-683-2128.

Sincerely,

Ralph Walls

President

Gila Bend Chamber of Commerce

Theles-



December 24, 1999

**REC'D JAN 03 2000** 

To whom it may concern,

As the Postmaster of the Gila Bend Post Office, I would like to say that I look forward to Panda Energy coming to Gila Bend, Arizona. Panda will be a benefit to our community by supplying jobs, an increase in revenues for established businesses in Gila Bend and more tax revenues for our schools. I also believe that Panda Energy will be a benefit to the State of Arizona by helping to lower the price of energy. I think that with different power companies we will have a more competitive market. I look forward to Panda being an active participant in the community of Gila Bend. If anyone would like to contact me on this subject I would be more than willing to talk about what I believe will be the positive impact that Panda Energy will have on our community, my work phone number is 1-520-683-2128.

1

Sincerely,

Ralph Walls

Postmaster

Gila Bend, AZ

85337-9998

# EXHIBIT J-4 MEETING THE GOALS OF THE GILA BEND STRATEGIC ECONOMIC AND COMMUNITY DEVELOPMENT PLAN

Gila Bend recently completed *Gila Bend Focused Future*: Strategic Plan for Economic Community Development (February 1999), which identified six focus areas for implementing the plan. The project will stimulate economic and community development in the Town of Gila Bend by contributing to each of the focus areas as discussed below.

### QUALITY OF LIFE PRESERVATION AND ENHANCEMENT

<u>Goal</u> — To preserve the small town atmosphere that current residence and visitors enjoy while enhancing the liability of the community.

The Applicant has acquired over 1,100 acres of land allowing for approximately 950 acres to remain rural in nature throughout the life of the project. This will not only preserve the quality of life but also enhance the natural environment associated with the Gila River along the Applicant's property. The size of the property also allows the Applicant to build an industrial facility in an open space setting, preserving the rural nature of Gila Bend.

### TOURISM DEVELOPMENT

<u>Goal</u> — To develop Gila Bend into a place where people not only stop on their way to another destination, but stop and stay awhile.

As part of their commitment to the community, the Applicant reviewed the Town's existing tourism development plan (which is focused on driving tours) with consulting landscape architects, recreation planners, and cultural resource specialists. In addition, the community strategic plan identified cultural and historical heritage diversity as an important part of the future. In response, the Applicant has developed a regional conceptual plan to integrate project lands into a driving tour or hiking tour of cultural resources in the area (Exhibit E-3). This included a recommendation for an interpretive center in the Town of Gila Bend, a driving tour that would include the San Lucy Village, Gatlin Site Cultural Park, a Butterfield Stage station, Butterfield Stage Route, and Old Highway 80. This conceptual plan was reviewed with the city manager to demonstrate how the Panda Gila River, L.P. property could be used to enhance recreational development. A conceptual landscape mitigation plan also has been prepared to examine options for screening the facility and reducing noise (see Exhibit E-3).

### **EDUCATION AND TRAINING**

<u>Goal</u> — To improve the education system for all of Gila Bend's residents and better prepare the workforce for the job market.

The project will contribute approximately \$2 to \$3 million in taxes to the community and schools. This increased tax base will provide for better facilities, schools, and ultimately an improved educational system. In addition, the plant will provide a forum for learning about energy technology.

### BUSINESS DEVELOPMENT

<u>Goal</u> — To place Gila Bend in a position to help local business prosper and expand, and also attract new business and jobs.

The project is anticipated to provide an average of 490 construction jobs, peaking at 1,030. During operation, the project is anticipated to provide approximately 60 permanent jobs and 200 additional secondary jobs. Additional local purchases are expected to total between \$5 and \$8 million.

### PHYSICAL INFRASTRUCTURE AND HOUSING DEVELOPMENT

<u>Goal</u> — To develop the physical infrastructure of the community to support business and commercial activity, housing development, and improve the health and safety of the citizens of Gila Bend.

The Applicant will provide \$2 to \$3 million in tax revenues to the city to be used for physical improvements. In addition, potable water and sewage connections have been requested. The Applicant is working with the Town to address needed improvements in the existing sewage treatment facilities. Once plant operation has begun, approximately 60 permanent plant jobs and 200 additional secondary jobs will be created. These additional jobs will create the need for additional housing and services.

### COMMUNICATION/COORDINATION/IMAGE ENHANCEMENT

<u>Goal</u> — To upgrade the communication and coordination within the community and among its citizens and improve the communication and coordination with Gila Bend's neighbors and other governmental agencies.

The Applicant's goal is to become part of the community and has opened and will continue communication and coordination not only with Town representatives but also with the general public and federal, state, and county officials.



PHASE II WATER SUPPLY REPORT PANDA GILA RIVER PROJECT GILA BEND, ARIZONA

Prepared for

PANDA GILA RIVER, L.P.

D&M Job No. 44525-001-058 January 17, 2000



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33250 CORTNEY

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### **EXECUTIVE SUMMARY**

### BACKGROUND AND SCOPE

Panda Gila River, L.P. (PGR) is evaluating an approximately 1,100-acre site near Gila Bend, Arizona, for the construction of a proposed 2,000-megawatt combined-cycle merchant power plant. The proposed power plant has been designated the Panda Gila River Project (Project). It is estimated that the plant will require a continuous 10,000-gallon per minute (gpm) water supply. The most readily available source of water for the power plant is groundwater, which is currently produced from three on-site production wells and is used for agricultural irrigation.

The results of previous studies indicate that there is a sufficient supply of groundwater of suitable quality to meet the demands of the proposed power plant for the projected 30-year life of the facility. The purpose of the Phase II investigation was to further evaluate the availability and quality of groundwater in the vicinity of the Project property, and to verify the results of the previous investigations. The objective of the Phase II investigation was to use existing wells to collect information on local groundwater quality and production potential.

The Phase II field investigation consisted of downhole geophysical logging, zonal groundwater sampling, and aquifer testing of two existing irrigation wells. Aquifer transmissivity values obtained from the tests were used to develop an analytical groundwater flow model, which was used to assess potential impacts of groundwater pumping on neighboring wells. The findings of the investigation were used to develop a production wellfield design for the power plant.

The wells tested as part of this investigation included an irrigation well located in the middle of the Project property (Middle Well) and Paloma Ranch well W72-10, which is located along the western edge of the Gila Bend Canal approximately 0.25 miles south of the Project property. The pumps were removed from these wells and a submersible test pump was installed to perform geophysical logging and zonal groundwater sampling under pumping conditions. Once testing was complete, a lineshaft turbine pump was installed for aquifer testing.

### **RESULTS**

### Well Yield and Specific Capacity

The results of the preliminary water supply investigation indicate that well yields for irrigation wells in the study area range from 1,000 to more than 4,000 gpm, with specific capacities ranging from 7 to 70 gallons per minute per foot (gpm/ft). During step-drawdown testing, the Middle Well was measured to have specific capacities ranging from 38 gpm/ft at 5,040 gpm to

48 gpm/ft at 2,500 gpm. In comparison, well W72-10 was measured to have specific capacities ranging from about 24 gpm/ft at 3,227 gpm to 34 gpm/ft at a discharge rate of 1,535 gpm. Results of the constant-rate pumping tests indicate that the Middle Well can be pumped at a rate of 4,100 gpm with 110 feet of drawdown, and well W72-10 can be pumped at 2,750 gpm with approximately 120 feet of drawdown.

The aquifer test results indicate that it will be feasible to construct a wellfield for the Project that can produce groundwater at a continuous rate of 10,000 gpm. This conclusion is supported by the fact that groundwater below the Project property has been used for agricultural irrigation since the property was first farmed in the 1970s, and is currently pumped at a rate of 10,000 gpm for nine months out of each year. New wells that are designed, constructed, and developed properly should be able to produce in the range of 2,000 to more than 4,000 gpm without experiencing excessive drawdown. Well specific capacity will likely range from 30 gpm/ft to 50 gpm/ft depending upon the length and placement of the screened interval.

### **Aquifer Transmissivity**

The results of 48-hour, constant-rate aquifer tests performed on three existing irrigation wells in the Gila Bend area during a previous investigation show aquifer transmissivity values that range from approximately 120,000 to 530,000 gallons per day per foot (gpd/ft). The results of the 72-hour, constant-rate aquifer test performed on the Middle Well during the Phase II field investigation show an estimated transmissivity value of 194,400 gpd/ft from the drawdown portion of the test, and a transmissivity value of 107,000 gpd/ft from the recovery data. Both of these values are generally within the range of values obtained from the previous investigation.

Estimated transmissivity values from the aquifer testing at well W72-10 range from 60,500 to 72,600 gpd/ft. These values are well below the range of values obtained from the previous investigation and from the Middle Well, and suggest that the aquifer test data have been influenced by the condition of the well. The values obtained from the well W72-10 test are not believed to accurately represent the transmissivity of the aquifer.

### Well Impact Analysis

An analytical groundwater flow model was developed to evaluate the potential impact of groundwater pumping on neighboring wells. For the analysis, it was assumed that seven groundwater production wells would be installed, and that the wells would be located as far away from neighboring wells and from each other as practicable to minimize interference effects. The

well impact analysis was performed using an average transmissivity value of 150,000 gpd/ft from the Middle Well aquifer test, and a storativity value of 0.05.

Potential impacts on neighboring wells were evaluated by simulating the drawdown caused by operating the proposed power plant production wells for the planned 30-year life of the facility. Model simulations were performed assuming that four of the seven production wells would be in operation at a given time, with each well operating at a continuous pumping rate of 2,500 gpm (i.e., a total pumping rate of 10,000 gpm).

The model-predicted drawdown in the immediate vicinity of the power plant production wells caused by operating the wells continuously at 10,000 gpm for 30 years ranges from about 50 to 70 feet. The projected drawdown at neighboring wells near the Project property ranges from less than 35 feet to 50 feet, depending upon the proximity of the neighboring well to the wellfield. The maximum predicted drawdown of 50 feet was observed at the existing production well located in the southeastern corner of Section 19, at the intersection of Stout and Watermelon roads. These predicted drawdowns will not interfere with the pumping capacity of the neighboring wells. Any impacts to neighboring wells will be further mitigated by routine operation and maintenance of the wellfield, during which groundwater will be pumped from only four out of seven wells at a given time.

### **Aquifer Sustainability**

The results of this water supply investigation indicate that there is a sufficient supply of groundwater beneath the Project property to meet the water supply requirements for the planned 30-year life of the proposed power plant. The observations that support his conclusion are discussed in the following paragraphs.

The Gila Bend basin receives a continuous supply of surface water from the Gila River. During the summer months, most of the flow is diverted into the Gila Bend Canal for agricultural irrigation. The remaining water in the river flows through the basin and recharges the aquifer. The Gila Bend Canal conveys surface water to agricultural lands north and west of the Project property. That portion of the irrigation water that is not consumed by crops or evaporation is recharged to the aquifer. Any remaining water in the canal flows into Bull Durham Wash west of Gila Bend and also serves as a source of recharge.

Groundwater has been used for agricultural irrigation in the Gila Bend basin since the 1930s, and is used to augment the surface water supply. Water level hydrographs from wells in the Gila Bend area show water level declines from the 1940s through the 1970s, followed by a leveling-

off or general rise in water levels from the 1980s through the present. This observation is probably due to a reduction in pumpage related to a reduction in irrigated acreage and an increase in surface water availability, and suggests that the Gila Bend basin is no longer in a state of groundwater overdraft.

The three existing irrigation wells on the Project property have operated since the 1970s, when the land was developed for farming. The three wells have a combined pumping capacity of approximately 10,000 gpm, and are currently operated nine months out of the year, from mid-January through mid-October. In spite of this sustained level of groundwater withdrawal, the static water level in the Middle Well is approximately 17 feet higher than it was at construction in 1977, and the static water level in well W72-10 is approximately 11 feet higher than in 1972 when the well was constructed. These observed water level increases indicate that the aquifer is continuing to recover, even though groundwater withdrawals are ongoing. It should be noted that the current pumping rate of 10,000 gpm is equivalent to the planned pumping rate for the power plant production wellfield, the only difference being that the production wellfield will pump continuously instead of nine months per year.

Decreasing agricultural water demand, increased surface water availability, high aquifer transmissivity, relatively stable water levels, and continuous recharge from the Gila River suggest that the aquifer can continue to sustain the proposed groundwater production rate of 10,000 gpm without excessive water level declines or impacts to neighboring wells.

### **Groundwater Quality**

The results of zonal groundwater sampling and analysis indicate that the highest quality groundwater is produced between about 350 and 700 feet below ground surface. Water quality is poorer in the shallow portions of the aquifer (above 300 feet) due to deep percolation of irrigation water. Total dissolved solids (TDS) concentrations decrease as the wells are pumped, and can be expected to stabilize after several weeks of continuous pumping. TDS concentrations also vary with placement of the screened interval. The results of the Phase II investigation and previous investigations indicate that TDS concentrations in groundwater at the on-site wells average around 1,400 milligrams per Liter (mg/L). However, if the wells are properly sealed in the upper 300 to 350 feet of the aquifer, it is reasonable to expect that TDS concentrations at the wellhead could be reduced by 10 to 15 percent.

### **CONCLUSIONS**

The conclusions of this investigation are summarized as follows:

- The results of the Phase II field investigation and previous studies indicate that there is a sufficient supply of groundwater of suitable quality to meet the demands of the proposed power plant for the projected 30-year life of the facility.
- TDS concentrations in groundwater can be expected to range from approximately 1,400 to 1,600 mg/L; however, TDS concentrations may be reduced by as much as 15 percent if the production wells are screened from 350 to 700 feet bgs, and the upper portions of the wells are sealed to prevent the downward migration of poorer-quality groundwater.
- Assuming that the production wells are screened from 350 to 700 feet bgs, each well can
  be expected to achieve a production rate of about 2,500 gpm; therefore, four production
  wells will likely need to be in operation at a given time to maintain a flow rate of 10,000
  gpm.
- The predicted drawdown at neighboring wells in the vicinity of the power plant caused by operating the facility's wellfield continuously at 10,000 gpm for 30 years ranges from less than 35 feet at the more distant wells to 50 feet at the nearest well.

### RECOMMENDATIONS

### Well Design and Drilling

The screened interval of each production well should begin no shallower than about 350 feet and extend no deeper than 700 to 750 feet. The annulus between the borehole and the casing should be sealed with cement grout from ground surface to about 10 feet above the top of the screened interval to prevent the downward migration of poor quality water into the well. Well casing and screen should consist of 18-inch diameter, corrosion resistant steel of appropriate wall thickness.

Well drilling should be performed using a reverse rotary rig. During pilot borehole drilling, cuttings should be collected at 10-foot intervals and logged. Once completed, geophysical logging should be conducted within the pilot borehole. After completion of geophysical logging, zonal groundwater samples should be collected from intervals selected from the lithologic and geophysical logs to confirm the water quality of the planned screened interval of the well. Sieve analyses should be performed on cuttings to assist in selecting the filter pack gradation and

screen slot size. Once the final well design is prepared, the pilot borehole will be reamed to approximately 26-inch diameter and the well will be constructed.

### Number of Wells and Redundancy

It is assumed that each new production well will be capable of producing 2,500 gpm. Thus, at a minimum, four new wells will be needed to meet the plant's projected demand of 10,000 gpm. However, wells should not be operated continuously for long periods of time and backup wells are needed during times of maintenance or repair. It is reasonable to assume that the average pumping frequency of any well will be around 60 percent, to allow for well cycling and maintenance. Thus, it is recommended that the facility have seven wells to meet the plant's demand and provide adequate redundancy.

### Well Siting and Spacing

As currently planned, the proposed power plant will be constructed in the southern part of the Project property. The production wellfield should be constructed in the vicinity of the power plant to minimize pipeline construction and maintenance costs. This approach will assist in optimizing groundwater quality, as TDS concentrations are lower in the southern part of the property. All of the wells should therefore be located in Section 20 with the exception of the Middle Well, which is located in Section 17 and will be used as a standby production well for the plant. The seven groundwater production wells should be located as far away as practicable from neighboring offsite wells and from each other to minimize interference effects.

### **Additional Testing**

Sufficient information has been collected regarding the production potential and sustainability of the aquifer at the proposed power plant site. However, the depth-specific water quality data collected as part of this investigation is inherently biased by the construction characteristics of the wells that were tested. The wells are screened over large intervals, including shallow portions of the aquifer (above 300 feet), and the extent and condition of their annular seals is unknown. If more accurate depth-specific water quality data are needed, we recommend that an exploratory boring be drilled and tested. Alternatively, a well could be constructed based on the design criteria provided in this report. Zonal groundwater samples could be collected after completion of the pilot borehole, and testing of the completed well would provide the best indication of composite groundwater quality.

### 1.0 INTRODUCTION

### 1.1 BACKGROUND

Panda Gila River, L.P. (PGR) is evaluating an approximately 1,100-acre site located 3 miles northeast of the Town of Gila Bend, Arizona, for the construction of a proposed 2,000-megawatt combined-cycle merchant power plant. The proposed power plant has been designated the Panda Gila River Project (Project). A key factor in the siting of the power plant is the availability and quality of water. It is estimated that the plant will require a continuous 10,000-gallon per minute (gpm) water supply. Surface water supplies in the Gila Bend area have already been appropriated for agricultural uses. The most readily available source of water for the power plant is groundwater, which is currently produced from three on-site production wells and is used for agricultural irrigation.

Previous water supply investigations have been completed, including a preliminary water supply investigation of the Gila Bend area, and a well inspection and groundwater quality assessment of the Project property. This report presents the results of the Phase II water supply investigation for the Project property, and summarizes the results of the previous investigations. This report was prepared by Dames & Moore for PGR in accordance with the scope of work presented in Dames & Moore's proposal dated October 6, 1999.

### 1.2 PURPOSE AND SCOPE

The purpose of the Phase II water supply investigation was to further evaluate the availability and quality of groundwater in the vicinity of the Project property, and to verify the results of previous investigations. The objective of the Phase II investigation was to use existing wells to collect information on local groundwater quality and production potential.

The Phase II field investigation consisted of downhole geophysical logging, zonal groundwater sampling, and aquifer testing of two existing wells. Aquifer transmissivity values obtained from the tests were used to develop an analytical groundwater flow model, which was used to assess potential impacts of groundwater pumping on neighboring wells. The findings of the investigation were used to develop a wellfield design intended to provide the facility with a water supply of sufficient quantity and quality.

The next phase of the project (Phase III) will involve final design, installation, testing, and equipping of the facility's production wells.

### 2.0 AQUIFER CHARACTERISTICS

### 2.1 LOCATION

The study area for this investigation is located in the southwestern portion of Maricopa County, Arizona, near the Town of Gila Bend (see Figure 1). The study area includes the Project property, which is located northeast of and partially within the Town of Gila Bend. The Project property consists of approximately 1,100 acres of predominantly agricultural land located in Sections 8, 17, and 20, with a small portion of the site within Sections 21 and 28, Township 5 South, Range 4 West of the Gila and Salt River Base Line and Meridian. The proposed power plant will be located in the south half of Section 20.

### 2.2 HYDROGEOLOGIC SETTING

The study area is located within the Gila Bend basin, a broad alluvial basin partially surrounded by fault-block mountain ranges. The basin is bounded by the Gila Bend Mountains and Buckeye Hills on the north, the Sauceda Mountains on the south, the Maricopa and Sand Tank Mountains on the east, and the Painted Rock Mountains on the west.

Groundwater in the Gila Bend basin occurs primarily in basin-fill deposits composed of unconsolidated to partially consolidated clay, silt, sand and gravel. The basin-fill deposits comprise a regional aquifer ranging in thickness from less than 100 feet near the margins of the basin to more than 3,000 feet in the central part of the basin, southeast of the Town of Gila Bend. Three distinct hydrogeologic units have been recognized in the Gila Bend basin (USBR, 1976).

- Upper Alluvial Unit (UAU): consists mainly of sand and gravel
- Middle Fine-Grained Unit (MFU): composed primarily of silt and clay
- Lower Conglomerate Unit (LCU): consists mainly of conglomerate, gravel and sand

Groundwater enters the Gila Bend basin from the north as underflow from the Rainbow Valley sub-basin of the Phoenix Active Management Area (AMA), and from the Lower Gila basin southwest of the study area. Groundwater also enters the study area as underflow from the southeast along Bender Wash near Bosque and from the south along Quilotosa Wash.

The principal sources of groundwater recharge to the Gila Bend Basin are infiltration from the Gila River, and incidental recharge from agricultural irrigation. Natural groundwater recharge

along stream channels and mountain fronts also occurs, although this source of recharge is relatively minor.

The Gila River enters the basin at Gillespie Dam, north of the study area, and exits the basin at Painted Rock Dam, northwest of the study area. The Gila River flows perennially through the study area primarily as a result of discharge of treated effluent from the 91st Avenue Wastewater Treatment Plant. During the growing season, most of the water within the Gila River is diverted at Gillespie Dam into two irrigation canals: the Enterprise Canal, which transports water to a farm approximately 6 miles south of the dam; and the Gila Bend Canal, which is owned and operated by Southwest Agribusiness Systems, Inc. (SASI) and transports water to Paloma Ranch agricultural lands located north and west of the Project property.

The principle source of groundwater discharge is groundwater pumpage, primarily for agricultural irrigation. Groundwater has been used as a source of agricultural irrigation in the Gila Bend basin since the 1930s. There are more than 100 irrigation wells in the Gila Bend Basin. Most of these wells are owned by Paloma Ranch and are operated seasonally as needed to supplement surface water from the Gila River. The three existing irrigation wells on the Project property have operated since the 1970s, when the land was developed for farming. The three wells have a combined pumping capacity of approximately 10,000 gpm, and are currently operated nine months out of the year.

### 2.3 RESULTS OF PREVIOUS INVESTIGATIONS

### 2.3.1 Phase I Well Inspection and Groundwater Quality Evaluation

In March 1999, Dames & Moore inventoried and collected groundwater quality samples from the three irrigation wells on the Project property as part of a Phase I environmental site assessment (Dames & Moore, 1999a). The wells were inspected and evaluated by a pump subcontractor, and the groundwater samples were analyzed by an Arizona-certified laboratory. Well locations are shown on Figure 1. The designations and locations of the three wells are summarized as follows:

Well ID (This Report)	Well ID (Phase I EA)	Location
Northern Well	3	C (5-4) 8DDB
Middle Well	2	C (5-4) 17DAA
Southern Well	1	C (5-4) 20DCB

The results of the well inspections indicated that all three wells were in operating condition, but required routine maintenance. Because there was no access for a water level sounder or a flow meter, it was not possible to estimate discharge rate or specific capacity; however, the sizes of the pump motors indicated that discharge rates would likely range from about 2,500 gallons per minute (gpm) in the Southern Well to 4,000 gpm in the Northern Well.

Groundwater quality data for the groundwater samples collected during the Phase I site assessment are presented in Table 1. The results indicate that groundwater beneath the Project property contains elevated concentrations of sodium, chloride, and other major ions, but does not contain any chemical constituents in excess of Arizona aquifer water quality standards. Groundwater beneath the northern part of the property may contain substantially higher concentrations of sodium, potassium, and calcium than groundwater beneath other parts of the site. This observation is consistent with the results of the preliminary water supply investigation (described in the next section), which indicate that groundwater quality improves with distance from the Gila River.

### 2.3.2 Preliminary Water Supply Investigation

In August 1999, Dames & Moore completed a preliminary water supply investigation of the Gila Bend area and the Project property (Dames & Moore, 1999b). The objective of the preliminary investigation was to characterize groundwater availability and quality in the vicinity of the Project property based solely on a compilation and review of available information. Most of this information was obtained from Dames & Moore's files, and had been compiled and evaluated during a previous water supply investigation of the Gila Bend basin. The existing file information was augmented with current hydrogeologic data from publicly available sources.

Figures 1 through 9 from the preliminary investigation are provided in Appendix A. The nine figures present most of the information compiled during the preliminary investigation, and are effective in illustrating groundwater conditions within the Gila Bend area and the Project property. The results of the preliminary water supply investigation are summarized as follows.

- Groundwater in the Gila Bend area occurs primarily in basin-fill deposits ranging in thickness from less than 100 feet near the margins of the basin to more than 3,000 feet in the central part of the basin (see Appendix A, figures 2 through 4).
- The average groundwater flow direction in the vicinity of the Project property is toward the south-southeast, away from the Gila River. The depth to groundwater beneath the property increases toward the south, ranging from less than 100 feet below ground

surface (bgs) near the Gila River to approximately 200 feet bgs in the southern part of the property (see Appendix A, figures 5 and 6).

- Water level hydrographs from the Gila Bend area show water level declines from the 1940s through the 1970s, followed by a leveling-off or general rise in water levels from the 1980s through the present. This observation is probably due to a reduction in irrigated acreage and an increase in surface water availability, and suggests that the Gila Bend basin is no longer in a state of groundwater overdraft (see Appendix A, Figure 7).
- Groundwater quality data from the Gila Bend area indicate that concentrations of total dissolved solids (TDS) are highest near the Gila River and decrease toward the south and east. Estimated TDS concentrations range from as high as 6,700 milligrams per liter (mg/L) near the Gila River, to less than 650 mg/L in the eastern part of the area (see Appendix A, Figure 8).
- Pumping capacities for irrigation wells in the Gila Bend area range from 1,000 to 4,000 gpm, with specific capacities ranging from 7 to 70 gpm per foot of drawdown (see Appendix A, Figure 9). Estimated transmissivity values obtained from the results of long-term aquifer tests performed on three existing irrigation wells in the Gila Bend area range from approximately 120,000 to 530,000 gallons per day per foot (gpd/ft).

In general, the results of the preliminary investigation indicate that there is a sufficient supply of groundwater of suitable quality to meet the water supply requirements for the planned 30-year life of the proposed power plant, but that any groundwater developed would require treatment prior to use as process or drinking water. The report prepared for the preliminary water supply investigation included recommendations for the Phase II investigation.

### 3.0 PHASE II FIELD INVESTIGATION

The Phase II field investigation consisted of evaluating, testing, and sampling two existing agricultural wells located in the vicinity of the Project property. The wells selected for testing were within or near the planned location of the Project's groundwater production well field to provide representative, site-specific data. Two wells were tested (instead of one) to assess potential variability in groundwater quality and aquifer transmissivity across the site. The first well tested was the Middle Well (see Section 2.3.1 and Figure 1), which is located near the approximate center of the Project property and at the northernmost extent of the planned groundwater production well field. Groundwater production wells will not be constructed north of the Middle Well to avoid pumping poorer-quality groundwater likely to be encountered near the Gila River; therefore, the Northern Well (see Section 2.3.1 and Figure 1) was not tested. The second well planned for testing was the Southern Well (see Section 2.3.1 and Figure 1), located near the proposed location of the power plant and at the southernmost extent of the planned groundwater production well field. Discussions with the former property owner indicated that the casing in the Southern Well had recently collapsed at 400 feet bgs, and that the well would not be suitable for testing. A decision was then made to select an alternative off-site well for The alternative second well tested is located immediately southeast of the Project property and is owned by Paloma Ranch; the well is designated by Paloma Ranch as W72-10. Well W72-10 was selected because it is the closest well to the southern boundary of the subject property that was available for testing (see Figure 1).

The following sections present results and provide interpretations of the various tests performed at the two well sites.

### 3.1 MIDDLE WELL

The Middle Well (C(5-4)17DAA) is located approximately near the center of the Project property (see Figure 1). The driller's log for this well indicates that it was drilled to a depth of 1,005 feet below ground surface (bgs) in 1977. The well was completed with 18-inch diameter casing to total depth, and was screened from 200 to 1,005 feet.

### 3.1.1 Well Video Survey

On November 1, 1999, the pump was removed from the Middle Well and a video survey was performed before proceeding with testing. The purpose of the video survey was to evaluate the well and verify that it was in adequate condition for testing. The video survey revealed that the

static water level was at the expected depth of about 116 feet bgs and the total depth of the well was 961 feet. Perforations were found to start at 180 feet instead of at 200 feet as indicated in the driller's log. The casing and perforations were in good condition with the exception of an abundance of hard nodules forming on the casing throughout much of the well. No structural damage was identified that would prevent testing.

### 3.1.2 Static Geophysical Logging

An 8-inch diameter electric submersible pump, 4-inch access tube, and 1-inch sounding tube were installed in the Middle Well. The pump intake was set at approximately 268 feet and the access tube extended to a depth of 277 feet bgs. The purpose of the access tube was to enable installation and removal of geophysical logging tools past the pump, and the sounding tube served as access for a water level sounder. The well discharge was directed into the irrigation canal located adjacent to the well site.

Testing began on November 10, 1999, with geophysical logging under static (non-pumping) conditions. Static geophysical logging consisted of a temperature log and a spectral gamma log. The temperature log measures fluid temperature throughout the well and is useful for identifying changes in fluid flow and potential water quality changes. The spectral gamma log measures natural gamma radiation from the formation and separates it into the individual thorium, uranium, and potassium K-40 spectra. This log is useful for identifying zones of permeability, assessing water quality constituents, and correlating stratigraphy. The primary features of these logs are discussed below followed by a discussion of their interpretation.

### 3.1.2.1 Temperature Log

Results of the temperature log are illustrated in Figure 2. The primary features of the temperature log are as follows:

- Rapid fluid temperature increase between 220 and 270 feet
- Decrease in fluid temperature directly below the bottom of the access tube at 270 feet
- Increase in fluid temperature at about 400 feet
- Constant fluid temperature from 480 to 800 feet
- Gradual increase in fluid temperature from about 800 to 950 feet

The observed overall increase in temperature with depth is as expected, and likely reflects the regional geothermal gradient.

### 3.1.2.2 Spectral Gamma Log

Spectral gamma logging was performed immediately after temperature logging. The spectral gamma log is illustrated in Figure 3. The primary features of this log are as follows:

- Strong variability from 116 feet (static water level) to about 300 feet
- Large positive shift at 200 feet
- Positive shift between 410 and 460 feet
- Negative thorium shift between 510 and 550 feet
- Gradual positive shift from 550 feet to the bottom of the well at 950 feet

### 3.1.2.3 Static Geophysical Log Interpretations

The greatest variability in fluid temperature, lithology, and likely groundwater quality occur within the upper 300 feet of the aquifer as indicated by both the temperature and spectral gamma logs. This likely represents a zone of interbedded sands and clays. The large positive shift in bulk gamma radiation at about 200 feet suggests the presence of a mineralized zone of high clay content. A formation change occurs at about 300 feet and the formation is fairly consistent to 410 feet. Increases in bulk gamma radiation as well as an increase in fluid temperature at 410 feet indicate a formation change. This formation change correlates with the driller's log, which describes a transition from "clay – little sand" to "90% small gravel – 10% clay" at 410 feet bgs. Based on this information, this likely represents the transition from the Middle Fine-Grained Unit (MFU) to the Lower Conglomerate Unit (LCU). The LCU is typically more coarse-grained than the MFU, but it is more consolidated and has lower permeability. The formation appears to become more consolidated below 550 feet and stays relatively consistent to the bottom of the well at 950 feet.

The static geophysical logs suggest that permeability and water quality are highly variable in the upper 300 feet of the aquifer. Zones of poor water quality occur between 180 and 300 feet bgs, as indicated by significant negative shifts in the spectral gamma log. The aquifer is generally permeable and water quality is consistent from 300 feet to about 550 feet. The aquifer becomes less permeable at about 550 feet and lithology remains consistent to the bottom of the well at 950 feet.

### 3.1.3 Dynamic Geophysical Logging

Dynamic (pumping) geophysical logging was conducted on November 11, 1999, and consisted of a flowmeter log and video survey.

### 3.1.3.1 Dynamic Flowmeter Log

The flowmeter log measures fluid velocities within the well and is presented as Figure 4. This log is used to identify the main producing zones within the well, which are represented by slopes on the flowmeter curve. The primary features of the flowmeter log for the Middle Well are as follows:

- Steep slope between 320 and 520 feet
- Flat flowmeter curve between 520 and 650 feet
- Gradual slope between 700 and 950 feet

The flowmeter survey was run at three different line speeds (30, 60, and 90 feet per minute) to evaluate the effect of line speed on fluid velocity. A correction is then made to account for the velocity of the tool as it moves through the water column. Flowmeter logging also included collection of fluid velocity measurements at specific depths within the well while the tool remained still (stop counts). Stop count data are used to verify flowmeter data and to accurately measure fluid velocity at proposed zonal groundwater sampling locations. Averages of the stop count data are illustrated as separate points on Figure 4. Note that these data are consistent with flowmeter data and that the largest increases in fluid velocity occur between 375 and 520 feet bgs.

### 3.1.3.2 Dynamic Video Survey

The dynamic video survey verified results of flowmeter logging. Fluid velocities were fairly stagnant at the bottom of the well, gradually increased to about 520 feet, and increased greatly between 550 and 320 feet. In addition, the video illustrated that the well is in good condition and produces very little sand or formation material.

### 3.1.3.3 Dynamic Geophysical Log Interpretations

Results of flowmeter logging are consistent with the spectral gamma log. The most permeable zones of the formation occur between 300 and 550 feet bgs. The flowmeter log suggests that between 60 and 70 percent of the flow to the well occurs within this 250-foot interval. According to the flowmeter log, very little production occurs between 550 and 700 feet bgs. Production occurs between 700 and 800 feet and between 850 and 950 feet. It is not known what contribution to the well occurs above 280 feet since fluid velocity cannot be measured accurately within the access tube.

### 3.1.4 Zonal Groundwater Sampling

Zonal (depth-specific) groundwater samples were collected to evaluate potential variability of groundwater quality with depth. The groundwater samples were analyzed by an Arizona-licensed laboratory for various metals and other inorganic chemical constituents pertinent to power plant water quality. Groundwater quality data are summarized in Table 2. Laboratory reports are available upon request.

Zonal groundwater samples were collected at the same depths as the stop counts (320, 375, 480, 530, 680, 830, and 950 feet). Zonal groundwater samples were not collected above 280 feet since the access tube extended to this depth. These samples were collected directly above and below producing intervals for the purpose of constraining the water quality within the respective producing interval. The theory is as follows.

If the producing interval is referred to as (i), the non-producing zone above the producing interval is referred to as (a), and the non-producing zone below is referred to as (b), the flow rate from the producing interval is equal to the difference between the flow rate at points (a) and (b):

$$Q_i = Q_a - Q_b$$

Therefore, a mass balance equation can be written that describes the flux of any water quality constituent at point (a) based on the combined fluxes from points (i) and (b):

$$C_aO_a = C_bO_b + C_iO_i$$

Thus, to solve for the concentration of any water quality constituent within the producing interval (i), the equations above can be rewritten as follows:

$$C_i = (O_aC_a - O_bC_b)/(O_a - O_b)$$

This analysis can be repeated for each producing interval to estimate the vertical distribution of the water quality constituent of interest (Collar and Mock, 1997).

The fluid velocity measurements (counts per second) (CPS) collected at the stop count depths were averaged to obtain a representative fluid velocity at each zonal sample location, since the zonal samples were taken at the same depth as the stop count measurements. These measurements were then converted into depth-specific discharge volumes (gallons per minute) based on the diameter of the casing and calibration of the flowmeter tool. Using the equations presented above, the depth-specific discharge volumes at the non-producing zones, and the

analytical data for the zonal groundwater samples, the concentrations of pertinent water quality constituents were estimated for the well's producing intervals. Data for selected constituents are presented in Figures 5 and 6.

### 3.1.5 Aquifer Testing

Once zonal groundwater sampling was completed at the Middle Well, the submersible pump was removed and a 14-inch diameter lineshaft turbine pump and sounding tube were installed for aquifer testing. The lineshaft turbine pump and gearhead drive were powered by a truck-mounted diesel engine. This pump assembly was used to enable pumping the well at variable rates and at high rates capable of stressing the aquifer.

### 3.1.5.1 Step-Drawdown Test

Aquifer testing at the Middle Well began with the performance of a step-drawdown test on December 2, 1999. The step-drawdown test consisted of pumping the well at five increasing rates ranging from 2,514 gpm to 5,040 gpm. Each step continued for approximately 2 hours. The purpose of this test is to evaluate water level response to increasing discharge rates, and is typically used to select the optimum rate for the constant-rate pumping test. Water levels within the well were monitored continuously throughout the test using a pressure transducer and data logger. In addition, field parameters (electrical conductivity, pH, and temperature) of the discharge water were monitored throughout the test and groundwater samples were collected at the end of each pumping step. Groundwater samples were collected to evaluate water quality variation with pumping rate.

Water level data collected during the step-drawdown test are presented in Figure 7. These data are presented in a drawdown versus time format. Drawdown measurements collected at the end of each step were also plotted versus discharge, and are presented in Figure 8. These data show that the water level (drawdown) response is generally linear, with pumping rates ranging from 2,514 to about 4,340 gpm. However, at a pumping rate of 5,040 gpm, drawdown increased at a greater rate. This implies a transition to turbulent flow within the well and indicates a decrease in well efficiency. Using this information, a pumping rate of approximately 4,100 gpm was selected for the constant-rate test.

During the step test, electrical conductivity of the discharge water decreased from 6,900 micromhos per centimeter (µmhos/cm) to about 4,800 µmhos/cm, where it stabilized. Temperature stayed fairly constant at 80 degrees Fahrenheit, and pH ranged from 7.02 to 7.38

Standard Units (SU). In general, electrical conductivity decreased with pumping time, temperature stayed constant, and pH increased with pumping rate and time.

Analytical results for groundwater samples collected during the step-drawdown test do not indicate any significant change in water quality with pumping rate during short duration pumping. For example, total dissolved solids (TDS) decreased from 3,800 milligrams per Liter (mg/L) at 2,500 gpm to 3,700 mg/L at 5,040 gpm. Likewise, nitrate decreased from 14 mg/L at 2,500 gpm to 13 mg/L at 5,040 gpm.

### 3.1.5.2 Constant-Rate Test

The constant-rate pumping test began the morning of December 3, 1999, and continued for approximately 75 hours. The pump was shut off at 10:45 a.m. on Monday morning, December 6, and water level recovery was recorded for approximately 23 hours. The test was conducted at 4,100 gpm, and groundwater samples were collected at the discharge after the first and third days of pumping to evaluate water quality variation with pumping duration.

Water level drawdown data collected during the constant-rate test are presented in Figure 9. These data are presented in a drawdown versus pumping time (time-drawdown) format. Water level recovery measurements are presented in Figure 10. Small variations in the drawdown data are attributable to variations in pumping rate, and are not believed to represent intersection of an impervious boundary.

Both drawdown and recovery data were analyzed to estimate aquifer transmissivity, which is the discharge per unit width of aquifer. Using the method developed by Cooper and Jacob (1946), aquifer transmissivity is calculated from the pumping rate and the slope of the time-drawdown graph over one log cycle. Analysis of the pumping data suggests that aquifer transmissivity is approximately 194,000 gallons per day per foot (gpd/ft). Analysis of the recovery data suggests that transmissivity is approximately 107,000 gpd/ft.

Aquifer storativity is related to the porosity and specific yield of the formation, and is a measure of the aquifer's ability to store and transmit groundwater. Storativity is typically estimated using time-drawdown data collected from an observation well since pumping well data are generally unreliable for storativity estimates. Thus, storativity could not be estimated accurately at this well site since an observation well was not available within a reasonable distance of the pumping well.

Field parameters were measured during the collection of groundwater samples. Electrical conductivity decreased from 5,500 to 4,400 µmhos/cm, and pH increased from 7.47 to 7.72 SU

within 24 hours of pumping. Temperature remained constant at 80 degrees Fahrenheit. After 75 hours of pumping, electrical conductivity had decreased to 3,150 µmhos/cm, pH increased to 7.96 SU, and temperature increased to 81.5 degrees Fahrenheit. Analysis of groundwater samples collected during the constant-rate test indicate that TDS decreased to 3,200 mg/L after one day of pumping, and further decreased to 1,900 mg/L after the third day of pumping (see Table 2). It should be noted that the TDS concentration in the sample collected in March 1999 was 1,400 mg/L (see Table 1), when the well had been pumping for several weeks prior to sample collection.

This observed improvement in groundwater quality with pumping duration is believed to be a function of the movement of poorer-quality groundwater from the uppermost portion of the aquifer down the well annulus during the time that the well was idle. Groundwater analytical results from samples collected during initial pumping reflect the influence of this poorer-quality water. With continued pumping over several weeks, the poorer-quality water is evacuated from the well and the analytical results are more representative of true groundwater quality conditions.

### 3.2 PALOMA RANCH WELL W72-10

Paloma Ranch well W72-10 (C(5-4)29ACC) is located along the western edge of the Gila Bend Canal approximately 0.25 miles south of the subject property (Figure 1). The driller's log for this well indicates that it was drilled in 1972 to a total depth of 1,296 feet bgs. The well was completed with 16-inch diameter casing to 460 feet bgs, and was screened with 12-inch wire-wrap casing from 460 to approximately 980 feet bgs (i.e., 520 feet of screen). It is assumed that the remainder of the borehole was not cased.

### 3.2.1 Well Video Survey

On November 16, 1999, the pump was removed from W72-10 and an initial video survey was performed. The video survey revealed that the static water level in the well was about 178 feet bgs and the total depth was 859 feet. Post-construction perforations had been punched in the blank casing from 200 to 400 feet bgs using a mills knife. The casing had been patched twice between 427 and 439 feet bgs, and a vertical split in the patch exists from 436 to 439 feet. Reduction to the 12-inch wire-wrap screen occurs at about 450 feet bgs. Plugging of the perforations was found to be so severe that the open area of the screen was essentially reduced to 0 percent. In addition, the video revealed that the well begins to deviate at about 70 feet bgs. Based on results of the video, it was decided that the well should be wire-brushed and re-videoed prior to making a determination whether to proceed with testing.

### 3.2.2 Well Cleaning and Video Survey

The well was wire-brushed for approximately 3.5 days to the current depth of 860 feet. Approximately 60 feet of additional fill was created from wire-brushing activities and was subsequently bailed out.

The well was re-videoed on December 2, 1999. The blank casing appeared completely cleaned and the perforated casing was cleaned sufficiently to view the condition of the screen. The wire-wrap screen, although increasingly plugged at depth, was in generally good condition. Based on results of the second well video, it was decided to proceed with testing of well W72-10.

### 3.2.3 Static Geophysical Logging

The same submersible pump and access tubing were installed in well W72-10 as were used in the Middle Well. It was estimated that this pump assembly should be capable of producing approximately 1,900 gpm from the well, which is sufficient for testing purposes. The pump intake was set at approximately 280 feet bgs and the access tube extended to a depth of 290 feet bgs to allow for anticipated drawdown during testing. The well discharge was directed into the Gila Bend Canal, which is adjacent to the well site.

Testing began on December 6, 1999, with static geophysical logging. Static geophysical logging consisted of temperature, spectral gamma, and static spinner logging. The static spinner log was performed to assess the fluid movement within the well under static conditions, and provides valuable information regarding the movement of water in and out of the well. The primary features of these logs are discussed below followed by a discussion of their interpretation.

### 3.2.3.1 Temperature Log

The temperature log for well W72-10 is presented as Figure 11. The primary features of this log are as follows:

- Groundwater averages about 8 degrees cooler in well W72-10 than the Middle Well
- Fluid temperature increase between 320 and 350 feet
- Fluid temperature decrease between 350 and 400 feet
- Fluid temperature increase at 470 feet
- Relatively stable fluid temperature from 600 to 800 feet
- Gradual fluid temperature increase from 800 feet to the bottom of the well

The observed overall increase in temperature with depth is as expected, and likely reflects the regional geothermal gradient.

### 3.2.3.2 Spectral Gamma Log

Results of the spectral gamma log are presented as Figure 12. The primary features of this log are as follows:

- Positive shift between 150 and 200 feet
- Negative shift between 310 and 350 feet
- Negative shift between 440 to 500 feet
- Low variability from 500 to 800 feet
- Gradual positive shift from 800 feet to the bottom of the well

### 3.2.3.3 Static Flowmeter Log

Results of the static flowmeter log are presented as Figure 13. The primary features of this log are as follows:

- Gradual increase in fluid velocity from 340 to 420 feet
- Abrupt increase in fluid velocity between 420 and 440 feet
- Fluid velocity increase between 470 and 480 feet
- Small-scale variations in fluid velocity between 480 and 770 feet
- Gradual increase in fluid velocity from 770 to the bottom of the well

### 3.2.3.4 Static Geophysical Log Interpretations

Aquifer permeability increases significantly between 150 and 200 feet and decreases slightly between 310 and 350 feet. This correlates with the driller's log, which indicates a formation change from "sand" to "gravel" at a depth of 200 feet. The formation remains permeable to a depth of 500 feet, which also correlates with the driller's log's indication of a formation change from "sand & gravel" to "clay" at 540 feet. The formation is relatively impermeable and lithologically consistent from 500 to 800 feet. Below 800 feet the formation changes again, which is indicated by a negative shift in bulk gamma, increase in fluid temperature, and increase in fluid velocity.

The majority of flow to the well likely occurs between 200 (beginning of perforations) and 550 feet bgs. Additional flow to the well occurs below 800 feet; however, water quality is somewhat degraded in this portion of the aquifer. A relatively small amount of flow to the well occurs between 550 and 800 feet, indicating that the formation is fairly consolidated within this portion of the aquifer.

The static geophysical logs from the Middle Well and well W72-10 are similar, indicating that aquifer permeability and yield characteristics are generally consistent between the two well sites, as expected. It should be noted that the elevation at well site W72-10 is about 50 feet higher than at the Middle Well site. The primary area of variability between the two well sites occurs between 150 and 250 feet bgs. The spectral gamma log from the Middle Well suggests more lithologic and water quality variability in this zone, especially at about 200 feet. Below 250 feet, the geophysical logs from both well sites correlate well.

### 3.2.4 Dynamic Geophysical Logging

Dynamic geophysical logging was conducted on December 7, 1999, and consisted of flowmeter logging. A dynamic well video was not performed at this well site.

### 3.2.4.1 Dynamic Flowmeter Log

The dynamic flowmeter log for well W72-10 is presented as Figure 14. Caution must be taken during interpretation of this log. Both the 30-foot per minute (ft/min) and 60-ft/min flowmeter curves suggest that fluid velocity increases with depth. However, the stop count data (shown as separate points on Figure 14) indicate that fluid velocity within the well decreases with depth. This is consistent with the 90-ft/min flowmeter curve. We believe that the severe deviation (crookedness) of the well obscured results of the flowmeter log, particularly at slower line speeds (i.e., 30 and 60 ft/min). Therefore, only the 90-ft/min flowmeter curve and stop count data were used for interpretation. The primary features of the flowmeter log and stop count data are as follows:

- Flow increases between 850 and 770 feet
- Minimal flow contribution between 740 and 550 feet
- Significant increase in flow between 550 and 450 feet
- Possible increase in flow between 400 and 380 feet
- Possible decrease in flow between 380 and 300 feet

Even though the stop count data indicate that fluid velocity (in CPS) is similar at 580 and 450 feet, respectively, the casing diameter increases from 12 to 16 inches just below 450 feet. Thus, significant flow contribution must occur within this interval to maintain the same fluid velocity as measured by the flowmeter.

### 3.2.4.2 Dynamic Geophysical Log Interpretation

The majority of flow to well W72-10 occurs between 300 and 550 feet. Minimal flow contribution occurs between 550 and 740 feet. Significant flow also occurs near the bottom of the well from a producing zone between 770 and 850 feet. These results correlate well with those obtained from the Middle Well (with the exception of significant flow contribution at the bottom of the well) and with the spectral gamma and static flowmeter surveys.

### 3.2.5 Zonal Groundwater Sampling

As with the Middle Well, zonal groundwater samples were collected from well W72-10 to evaluate potential variability of groundwater quality with depth. The groundwater samples were analyzed by an Arizona-licensed laboratory for various metals and other inorganic chemical constituents pertinent to power plant water quality. Groundwater quality data are summarized in Table 2. Laboratory reports are available upon request.

Groundwater samples were collected at the same depths as the stop count readings (360, 400, 450, 580, 700, 770, and 850). Samples were not collected above 290 feet since the access tube extended to this depth. These samples were collected directly above and below producing zones in the same manner as those collected at the Middle Well. The fluid velocity measurements (in counts per second) collected at the stop count depths were averaged to obtain a representative fluid velocity at each zonal sample location. These measurements were then converted into depth-specific discharge volumes (in gpm) based on the diameter of the casing and calibration details of the flowmeter tool. Using the same procedure as used for the Middle Well, the concentrations of pertinent water quality constituents were estimated for the well's producing intervals. Selected data are presented in Figures 15 and 16.

### 3.2.6 Aquifer Testing

Once zonal groundwater sampling was completed at well W72-10, the submersible pump was removed and a 12-inch diameter lineshaft turbine pump and access tube were installed for aquifer testing. The lineshaft turbine pump and gearhead drive were powered by a truck-mounted diesel engine. This pump assembly was used to enable pumping the well at variable rates and at high rates capable of stressing the aquifer.

### 3.2.6.1 Step-Drawdown Test

Aquifer testing at well W72-10 began with the performance of a step-drawdown test on December 18, 1999. The step-drawdown test consisted of pumping the well at five increasing

rates ranging from 1,535 gpm to 3,227 gpm. Each step continued for approximately 2 hours. The purpose of this test was to evaluate water level response to increasing discharge rates, and to select the optimum rate for the constant-rate pumping test. Water levels within the well were monitored continuously throughout the test using a pressure transducer and data logger. In addition, field parameters (electrical conductivity, pH, and temperature) of the discharge water were monitored throughout the test.

Water level data collected during the step-drawdown test are presented in Figure 17. These data are presented in a drawdown versus time format. Drawdown measurements collected at the end of each step were also plotted versus discharge, and are presented in Figure 18 along with associated specific capacity measurements. The data indicate that drawdown is generally linear with pumping rates ranging from 1,535 to about 2,500 gpm. However, at pumping rates greater than 3,000 gpm, drawdown increased at a greater rate. This implies a transition to turbulent flow within the well between 2,500 and 3,000 gpm and indicates a decrease in well efficiency. Using this information, a pumping rate of approximately 2,750 gpm was selected for the constant-rate test.

During the step-drawdown test, electrical conductivity of the discharge water generally ranged between 3,300 and 3,500 µmhos/cm. Temperature stayed fairly constant at 78 degrees Fahrenheit, and pH ranged from 7.38 to 7.5 Standard Units (SU). In general, electrical conductivity and temperature stayed fairly constant, and pH increased with pumping rate and time.

### 3.2.6.2 Constant-Rate Test

The constant-rate pumping test began the morning of December 20, 1999, and continued for approximately 72 hours. The pump was shut off at 8:15 a.m. on Thursday morning, December 23, and water level recovery was recorded for approximately 25 hours. The test was conducted at 2,750 gpm, and groundwater samples were collected at the discharge several hours after the pump was started and just prior to shutting off the pump to evaluate water quality variation with pumping duration.

Water level drawdown data collected during the constant-rate test are presented in Figure 19. These data are presented in a drawdown versus pumping time (time-drawdown) format. Water level recovery measurements are presented in Figure 20. Small variations in the drawdown data are attributable to variations in pumping rate, and do not represent intersection of an impervious boundary.

Both drawdown and recovery data were analyzed to estimate aquifer transmissivity. Using the method developed by Cooper and Jacob (1946), aquifer transmissivity was calculated from the pumping rate and the slope of the time-drawdown graph over one log cycle. Analysis of the pumping data suggests that aquifer transmissivity at well W72-10 is approximately 60,500 gpd/ft. Analysis of the recovery data suggests that transmissivity is approximately 72,600 gpd/ft.

Water levels were monitored at well W-26 during the test, with the intention of using the time-drawdown data collected at this well to estimate aquifer storativity. Well W-26 is located approximately 0.6 mile to the northeast of well W72-10. Negligible drawdown was observed at this well during conductance of the constant-rate test. Thus, data were not available to estimate aquifer storativity.

Field parameters were measured in the beginning and at the end of the constant-rate test. Electrical conductivity decreased from 3,800 to 3,400 µmhos/cm, and pH increased from 7.37 to 7.61 SU during the 72-hour test. Temperature decreased slightly from 77 to 76 degrees Fahrenheit. Analysis of groundwater samples collected during the constant-rate test indicate that TDS decreased from 2,000 mg/L to 1,900 mg/L after three days of pumping (see Table 3).

### 4.0 DATA ANALYSIS

This section discusses the production potential and quality of groundwater in the vicinity of the proposed Project based on the results of the Phase II field investigation and previous studies. Included in this section is an analysis of potential well impacts and a discussion of aquifer sustainability.

### 4.1 GROUNDWATER PRODUCTION POTENTIAL

The evaluation of groundwater production potential considers the aquifer's ability to provide the necessary quantity of water required by the proposed power plant, which is estimated to be approximately 10,000 gpm continuously. Aquifer testing results obtained from the current and previous field investigations were analyzed to develop conclusions regarding groundwater production potential.

### 4.1.1 Well Yield and Specific Capacity

The results of the preliminary water supply investigation indicated that well yields for irrigation wells in the study area range from 1,000 to more than 4,000 gpm, with specific capacities ranging from 7 to 70 gallons per minute per foot (gpm/ft) of drawdown (Dames & Moore, 1999b). Specific capacity (discharge/drawdown) is a function of both well efficiency and aquifer transmissivity.

During step-drawdown testing, the Middle Well was measured to have specific capacities ranging from 38 gpm/ft at 5,040 gpm to 48 gpm/ft at 2,500 gpm. In comparison, well W72-10 was measured to have specific capacities ranging from about 24 gpm/ft at 3,227 gpm to 34 gpm/ft at a discharge rate of 1,535 gpm. At the end of the constant-rate test, the Middle Well had a specific capacity of 37 gpm/ft at 4,100 gpm; whereas, well W72-10 had a specific capacity of about 23 gpm/ft at 2,750 gpm. Aquifer test results indicate that the Middle Well can be pumped at a rate of 4,100 gpm with 110 feet of drawdown, and well W72-10 can be pumped at 2,750 gpm with approximately 120 feet of drawdown.

It is important to note that well W72-10 is screened with 12-inch diameter casing, whereas the Middle Well is screened with 18-inch diameter casing. In addition, well W72-10 had not been operated for several years prior to use for this investigation and was in poor condition prior to testing. Because of these factors, well W72-10 would not be expected to produce groundwater at discharge rates or efficiencies comparable to the Middle Well. Thus, aquifer test results from the Middle Well are believed to be more representative of the aquifer's production capabilities. It is

likely that both wells would produce groundwater at higher rates and operate more efficiently if thoroughly cleaned and rehabilitated.

These results indicate that it will be feasible to construct a wellfield for the Project that can produce groundwater at a rate of 10,000 gpm continuously. This conclusion is supported by the fact that groundwater below the Project property has been used for agricultural irrigation since the property was first farmed in the 1970s, and is currently pumped at a rate of 10,000 gpm for nine months out of each year. New wells that are designed, constructed, and developed properly should be able to produce in the range of 2,000 to more than 4,000 gpm without experiencing excessive drawdown. Well specific capacity will likely range from 30 gpm/ft to 50 gpm/ft depending upon the length and placement of the screened interval.

### 4.1.2 Aquifer Transmissivity

During a previous water supply investigation, 48-hour, constant-discharge aquifer tests were performed on three existing irrigation wells in the Gila Bend area. The results of these tests, which are presented in the preliminary water supply report, show aquifer transmissivity values that range from approximately 120,000 to 530,000 gpd/ft (Dames & Moore, 1999b).

The results of the 72-hour, constant-discharge aquifer test performed on the Middle Well during the Phase II field investigation show an estimated transmissivity value of 194,400 gpd/ft from the drawdown portion of the test, and a transmissivity value of 107,000 gpd/ft from the recovery data. Both of these values are generally within the range of values obtained from the previous investigation.

Results of aquifer testing at well W72-10 suggest an estimated transmissivity value of 60,500 gpd/ft from the drawdown data, and a transmissivity value of 72,600 gpd/ft from the recovery portion of the test. Both of these values are well below the range of values obtained from the previous investigation and from the Middle Well, and suggest that the aquifer test data have been influenced by the condition of the well. For this reason, the transmissivity values obtained from aquifer test at well W72-10 are not believed to accurately represent the transmissivity of the aquifer.

### 4.1.3 Well Impact Analysis

An analytical groundwater flow model was developed to evaluate the potential impact of groundwater pumping on neighboring wells. The modeling software selected for this analysis was DREAM (Bonn and Rounds, 1990), a computer-based, analytical groundwater flow model capable of simulating groundwater elevation, drawdown, velocity and streamlines. The

drawdown option was selected for the well impact analysis. DREAM calculates transient drawdown data for each pumping well using the Theis equation (Driscoll, 1986), which defines unsteady, radial flow in a confined aquifer.

For the analysis, it was assumed that seven groundwater production wells would be installed, and that the wells would be located as far away from neighboring wells and from each other as practicable to minimize interference effects (see Section 5.2.3). All of the wells would be located in Section 20 with the exception of the Middle Well, which is located in Section 17 (see Figure 21). The well impact analysis was performed using an average transmissivity value of 150,000 gpd/ft from the Middle Well aquifer test, and a storativity value of 0.05.

Potential impacts on neighboring wells were evaluated by simulating the drawdown caused by operating the proposed power plant production wells for the planned 30-year life of the facility. Model simulations were performed assuming that four of the seven production wells would be in operation at a given time, with each well operating at a continuous pumping rate of 2,500 gpm (i.e., a total pumping rate of 10,000gpm).

The results of the well impact analysis are shown on Figure 21. The model-predicted drawdown in the immediate vicinity of the power plant production wells caused by operating the wells continuously at 10,000 gpm for 30 years ranges from about 50 to 70 feet. The projected drawdown at neighboring wells near the Project property ranges from less than 35 feet to 50 feet, depending upon the proximity of the neighboring well to the wellfield. The maximum predicted drawdown of 50 feet was observed at the existing production well located in the southeastern corner of Section 19, at the intersection of Stout and Watermelon roads. These predicted drawdowns would not interfere with the pumping capacity of the neighboring wells. Any impacts to neighboring wells would be further mitigated by routine operation and maintenance of the wellfield, during which groundwater will be pumped from only four out of seven wells at a given time.

### 4.1.4 Aquifer Sustainability

The results of this water supply investigation indicate that there is a sufficient supply of groundwater beneath the Project property to meet the water supply requirements for the planned 30-year life of the proposed power plant. The observations that support his conclusion are discussed in the following paragraphs.

The Gila Bend basin receives a continuous supply of surface water from the Gila River, which consists mainly of treated effluent from the City of Phoenix 91<sup>st</sup> Avenue Waste Water Treatment

Plant. During the summer months, most of the flow in the river is diverted at Gillespie Dam into the Gila Bend Canal for agricultural irrigation. The remaining water in the river flows through the basin and recharges the aquifer; a small portion of the remaining flow exits the basin at Painted Rock Dam west of Gila Bend. The Gila Bend Canal conveys surface water to agricultural lands north and west of the Project property. That portion of the irrigation water that is not consumed by crops or evaporation is recharged to the aquifer. Any remaining water in the canal flows into Bull Durham Wash west of Gila Bend and also serves as a source of recharge to the aquifer.

Groundwater has been used for agricultural irrigation in the Gila Bend basin since the 1930s, and is used to augment the surface water supply. As noted in Section 2.3.2, however, water level hydrographs from wells in the Gila Bend area show water level declines from the 1940s through the 1970s, followed by a leveling-off or general rise in water levels from the 1980s through the present. This observation is probably due to a reduction in pumpage related to a reduction in irrigated acreage and an increase in surface water availability, and suggests that the Gila Bend basin is no longer in a state of groundwater overdraft (see Appendix A, Figure 7).

The three existing irrigation wells on the Project property have operated since the 1970s, when the land was developed for farming. The three wells have a combined pumping capacity of approximately 10,000 gpm, and are currently operated nine months out of the year, from mid-January through mid-October. In spite of this sustained level of groundwater withdrawal, the static water level in the Middle Well is approximately 17 feet higher than it was at construction in 1977, and the static water level in well W72-10 is approximately 11 feet higher than in 1972 when the well was constructed. These observed water level increases indicate that the aquifer is continuing to recover, even though groundwater withdrawals are ongoing. It should be noted that the current pumping rate of 10,000 gpm is equivalent to the planned pumping rate for the power plant production wellfield, the only difference being that the production wellfield will pump continuously instead of nine months per year.

Decreasing agricultural water demand, increased surface water availability, high aquifer transmissivity, relatively stable water levels, and continuous recharge from the Gila River suggest that the aquifer can continue to sustain the proposed groundwater production rate of 10,000 gpm without excessive water level declines or impacts to neighboring wells.

### 4.2 GROUNDWATER QUALITY

The quality of groundwater produced from the Project's new wellfield will be a function of well design, pumping rate, pumping duration, and seasonal water level fluctuation due to pumping of

nearby wells. The scope of the field investigation included an evaluation of groundwater quality with depth for the purpose of identifying aquifer zones that supply the highest quality water. Groundwater samples were also collected during aquifer testing to evaluate groundwater quality variations with pumping rate and short-term (up to 3 days) pumping duration. Conclusions regarding groundwater quality are discussed below.

### 4.2.1 Depth-Specific Groundwater Quality

Collection of depth-specific groundwater quality data is discussed in the Zonal Groundwater Sampling subsections of Section 3.0. Depth-specific groundwater samples were collected under pumping conditions above and below producing intervals. These data were analyzed in combination with depth-specific discharge data to obtain estimates of water quality constituent concentrations within the well's producing intervals.

### 4.2.1.1 Middle Well

Water quality data obtained from analysis of groundwater samples from the Middle Well were substantially different from those collected from sampling the well in March 1999 (Dames & Moore, 1999a), and are not believed to be representative of groundwater quality conditions at the site. As discussed in Section 3.0, the higher TDS concentrations obtained from the Phase II sampling are believed to be influenced by movement of poorer-quality groundwater from the uppermost portion of the aquifer down the well annulus during the time that the well was idle.

Geophysical logs and evidence from other agricultural areas (USGS, 1999) suggest the presence of accumulated salts in the vadose zone and shallow groundwater due to the leaching of salts from the root zone. The soils at the subject property are predominantly sands and gravels, and infiltration rates are very high. Therefore, it is likely that deep percolation of irrigation water at the site has transported salts deep into the vadose zone and shallow groundwater at the site (possibly as deep as 200 feet). It is not uncommon for salt concentrations in the deep percolation water to be as much as five times higher (Bouwer, 1990) than those of the original groundwater used for irrigation. As long as the Project's wells are constructed and sealed properly and groundwater from salt accumulation zones is not allowed into the wells, groundwater quality should be acceptable.

The Middle Well's perforations begin at a shallow depth (180 feet bgs), and the well is likely not sealed properly. In addition, this well and most other irrigation wells in the area had been shut off for several weeks prior to testing. It is possible that the rise in water level in response to cessation of pumping caused groundwater to intersect these salt accumulation zones, which

would explain the significant reduction in groundwater quality. This is supported by groundwater quality data collected during aquifer testing, which indicates an improvement in groundwater quality with pumping duration.

As a result, the zonal groundwater sampling data collected from the Middle Well should only be considered qualitative. These data are useful for comparing relative salt concentrations between aquifer zones, but should not be used for predicting actual salt concentrations in groundwater.

At the Middle Well, the zones of highest quality groundwater are between 320 and 680 feet bgs. Groundwater samples were not attainable above 280 feet because of interference from the access tube. However, TDS concentrations increase from 3,600 mg/L at 320 feet to 4,100 mg/L (about 14 percent) at the discharge and relatively little additional flow is obtained above 320 feet. This suggests that groundwater entering the well above 320 feet has a TDS concentration substantially higher than 3,600 mg/L, and supports the concept that zones of accumulated salts are present in the shallow groundwater and vadose zone. Below 680 feet, TDS, nitrate, and some metals generally increase. This could also be a function of relatively stagnant fluid flow within the well at these depths.

### 4.2.1.2 Well W72-10

Interpretation of zonal groundwater quality data collected from well W72-10 is complicated by the effect of well deviation on collection of flowmeter data. However, the best water quality zones at well W72-10 appear to be between 400 and 700 feet bgs. The access tube, which was set at 290 feet bgs, precluded groundwater sampling above 300 feet bgs. Therefore, groundwater quality above this depth is unknown. However, TDS increased from 1,700 mg/L at 360 feet to 2,000 mg/L (about 18 percent) at the discharge without a significant increase in flow within this interval. This suggests that groundwater entering the well above 360 feet (the shallowest sample depth) contains substantially higher concentrations of dissolved solids.

Considering that well W72-10 is approximately 50 feet higher in elevation than the Middle Well, the zones of highest quality groundwater correlate well between the two well sites. Groundwater is generally of poorer quality within the shallower zones of the aquifer above 300 feet, where it is influenced by the deep percolation of irrigation water containing high concentrations of salts. Below 300 feet, groundwater quality generally improves and remains acceptable to about 700 feet bgs. Groundwater in the deeper portions of the aquifer appears to be of generally poorer quality.

### 4.2.2 Composite Groundwater Quality

Composite groundwater quality is a function of the relative discharge from and salt concentration within the producing zones screened in the well. The wells tested during this field investigation are screened over large portions of the aquifer, including shallow zones impacted by deep percolation of irrigation water. Therefore, information collected from these wells is not necessarily representative of what composite groundwater quality would be from a well that was only screened over the aquifer zones that appear to provide the highest quality water.

Composite groundwater quality data collected in February 1999 indicated that TDS ranged from 1,200 mg/L to 1,400 mg/L from the three wells located within the Project property (Dames & Moore, 1999a). Further testing of the Middle Well in November indicated that TDS increased substantially (4,100 mg/L) after the well had been idle for several weeks. However, TDS decreased to 1,900 mg/L after three days of pumping during the constant-rate test. Similarly, the TDS concentration measured at the discharge of well W72-10 decreased from 2,000 mg/L to 1,900 mg/L during the constant-rate test.

Based on results of previous investigations and data collected as part of the Phase II water supply investigation, it is reasonable to expect that composite TDS concentrations at the proposed power plant site is expected to be in the range of 1,400 to 1,600 mg/L. However, it is likely that new wells designed with carefully-placed screened intervals will produce groundwater of better quality. If the shallower zones of the aquifer are sealed off and the wells are not completed deeper than about 700 feet, it is possible that composite TDS concentrations may be reduced by as much as 15 percent. However, this cannot be confirmed and composite groundwater quality will not be known until a new production well is installed and tested at the site.

### 5.0 CONCLUSIONS AND RECOMMENDATIONS

### 5.1 CONCLUSIONS

The conclusions of this investigation are summarized as follows:

- The results of the Phase II field investigation and previous studies indicate that there is a sufficient supply of groundwater of suitable quality to meet the demands of the proposed power plant for the projected 30-year life of the facility.
- TDS concentrations in groundwater can be expected to range from approximately 1,400 to 1,600 mg/L; however, TDS concentrations may be reduced by as much as 15 percent if the production wells are screened from 350 to 700 feet bgs, and the upper portions of the wells are sealed to prevent the downward migration of poorer-quality groundwater.
- Assuming that the production wells are screened from 350 to 700 feet bgs, each well can
  be expected to achieve a production rate of about 2,500 gpm; therefore, four production
  wells will likely need to be in operation at a given time to maintain a flow rate of 10,000
  gpm.
- The predicted drawdown at neighboring wells in the vicinity of the power plant caused by operating the facility's wellfield continuously at 10,000 gpm for 30 years ranges from less than 35 feet at the more distant wells to 50 feet at the nearest well.

### 5.2 RECOMMENDED WELLFIELD DESIGN

Wellfield design considerations include design capacity, water quality, well siting, well spacing, and redundancy. The results of this investigation suggest that a wellfield can be constructed at the proposed power plant site that will meet the design capacity of 10,000 gpm. Testing of existing wells indicates that individual wells can be constructed that will produce as much as 4,000 gpm. In order to optimize groundwater quality and minimize adverse impacts to on-site and/or nearby wells, wells should be constructed with limited screened intervals and be sufficiently spaced. The following presents our recommendations regarding well design, well spacing, and redundancy.

### 5.2.1 Well Design and Drilling

The preliminary well design is provided as Figure 22. Based on the data collected thus far, well depth should not exceed 650 to 750 feet depending on well site elevation. The screened interval

should not start shallower than about 350 feet and extend no deeper than 700 to 750 feet bgs. The annulus between the borehole and the casing should be sealed with cement grout from ground surface to about 10 feet above the top of the screened interval. This seal will prevent the downward migration of poor quality water into the well. Well casing and screen should consist of 18-inch diameter, corrosion resistant steel of appropriate wall thickness. Screen slot size and filter pack gradation will be designed based on characteristics of the formation encountered during drilling and borehole geophysical logs.

Well drilling should be performed using a reverse rotary rig with sufficient mast capacity to support the anticipated weight of the casing string. A 17½-inch diameter pilot borehole should be drilled to approximately 800 feet. During pilot borehole drilling, cuttings should be collected at 10-foot intervals and preserved on-site. Once completed, geophysical logging should be conducted within the pilot borehole. After completion of geophysical logging, zonal groundwater samples should be collected from intervals selected from the lithologic and geophysical logs. The purpose of collecting zonal samples is to confirm the water quality of the portions of the aquifer intended for production. Sieve analyses should be performed on formation samples that represent the finest-grained material that will be screened. Filter pack gradation and screen slot size will be designed based on results of the sieve analyses. Once the final well design is prepared, the pilot borehole will be reamed to approximately 26-inch diameter and the well will be constructed.

### 5.2.2 Number of Wells and Redundancy

It is assumed that each new production well will be capable of producing 2,500 gpm. Thus, at a minimum, four new wells would be needed to meet the plant's projected demand of 10,000 gpm. However, wells should not be operated continuously for long periods of time and backup wells are needed during times of maintenance or repair.

In order to allow downtime for well cycling and maintenance, it is reasonable to assume that the average pumping frequency of any well will be around 60 percent. Assuming a well design capacity of 2,500 gpm and a pumping frequency of 60 percent, the annualized pumping capacity of each well will be around 1,500 gpm. Thus, it is recommended that the power plant have seven wells to meet the plant's demand and provide adequate redundancy.

### 5.2.3 Well Siting and Spacing

As currently planned, the proposed power plant will be constructed in the southern part of the Project property, on the north side of Watermelon Road. The production wellfield should be

constructed in the vicinity of the power plant to minimize pipeline construction and maintenance costs. This approach will assist in optimizing groundwater quality, as TDS concentrations are lower in the southern part of the property. All of the wells should therefore be located in Section 20 with the exception of the Middle Well, which is located in Section 17 and will be used as a production well for the plant; it is recommended that no production wells be constructed north of that well.

The seven groundwater production wells should be located as far away as practicable from neighboring offsite wells and from each other to minimize interference effects (see Figure 21). An operating plan will be developed for the wells that will optimize the distribution of pumping across the wellfield, which will further minimizing well interference.

### 5.3 RECOMMENDATIONS FOR ADDITIONAL TESTING

Sufficient information has been collected regarding the production potential and sustainability of the aquifer at the proposed power plant site. However, the depth-specific water quality data collected as part of this investigation is inherently biased by the construction characteristics of the wells that were tested. The wells are screened over large intervals, including shallow portions of the aquifer (above 300 feet), and the extent and condition of their annular seals is unknown. If more accurate depth-specific water quality data are needed, we recommend that an exploratory boring be drilled and tested. Alternatively, a well could be constructed based on the design criteria provided in this report. Zonal groundwater samples could be collected after completion of the pilot borehole, and testing of the completed well would provide the best indication of composite groundwater quality.

### 6.0 REFERENCES

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### **TABLES**

TABLE 1
Phase I Groundwater Quality Data

Well ID Sample Collection Date Laboratory ID Number	Southern Well 3/3/99 PIC00332	Middle Well 3/3/99 PIC00330	Northern Well 3/3/99 PIC00331
Indicator Parameters	1100332	1100550	11000331
TDS	1,200	1,400	1,300
Specific Conductanceb	2,500	2,600	2,400
Specific Conductance <sup>b</sup> (field)	1,100	1,150	1,200
pHc	7.9	7.9	7.7
pH <sup>c</sup> (field)	7.1	7.14	7.08
Temperatured (field)	26.6	28.05	28.05
Major Ions			
Bicarbonate	93	92	100
Carbonate	<5.0	<5.0	<5.0
Hydroxide	<5.0	<5.0	<5.0
Total Alkalinity	93	92	100
Calcium	64	67	870e
Chloride	660	630	540
Fluoride	4.3	4.4	1.9
Magnesium	3.3	3.4	236
Potassium	8.7	9.5	600e
Sodium	400	410	2,000
Sulfate	190	190	200
Metals	·		
Aluminum	<0.10	<0.10	<0.10
Antimony	<0.0040	< 0.0040	< 0.0040
Arsenic	0.0082	0.0074	< 0.0050
Barium	< 0.050	< 0.050	<0.050
Beryllium	<0.0020	< 0.0020	< 0.0020
Cadmium	< 0.00050	< 0.00050	0.022
Chromium	0.0064	0.0051	0.080
Copper	< 0.050	< 0.050	<0.050
Iron	0.050	0.07	2.1
Lead	< 0.0050	< 0.0050	< 0.0050
Manganese	< 0.050	<0.050	0.39
Mercury	< 0.00020	< 0.00020	< 0.00020
Nickel	< 0.050	<0.050	< 0.050
Selenium	<0.0050	< 0.0050	< 0.0050
Silicate	26	28	24
Silver	< 0.0050	< 0.0050	<0.0050
Thallium	< 0.0020	< 0.0020	< 0.0020
Vanadium	<0.20	<0.20	<0.20
Zinc	< 0.050	< 0.050	1.1

a - All analytical results are in milligrams per liter (mg/L) except where noted.

b - micromhos per centimeter (µmhos/cm)

c - standard units (S.U.)

d - degrees Celcius (°C)

e - Elevated values confirmed by the analytical laboratory.

### TABLE 1 (Cont'd.)

Well ID Sample Collection Date Laboratory ID Number	Southern Well 3/3/99 PIC00332	Middle Well 3/3/99 PIC00330	Northern Well 3/3/99 PIC00331
Nitrogen Compounds and Pho	sphorous		
Nitrate as N	2.6	2.8	6.1
Nitrite as N	<0.10	<0.10	<0.10
Nitrate/Nitrite as N	2.6	2.8	6.1
Ammonia as N	<0.50	<0.50	<0.50
Total Kjeldahl Nitrogen	110	62	97
Phosphate as P	< 0.050	< 0.050	<0.050
Additional Organic Parameter	rs	•	
ТРН	<1.0	1.8	<1.0
TOC	10	11	14
Total Coliformb	<1	<1	<1

Table 2

## **Groundwater Quality Data** Middle Well

				W-F COUNTING	W-2 Constant-1   W-2 Constant-2	11-4 4,000	UUC,6 2-77	W-2 5,000
94         95         96         93         94         93         93           ND         ND         ND         ND         ND         ND         ND           94         95         96         93         94         93         93           94         95         96         93         94         93         93           ND         ND         ND         ND         ND         ND         ND           1800         1800         1800         1600         1400         1300         ND           17         18         18         14         12         12         11         ND           ND         ND         ND         ND         ND         ND         ND         ND         ND           6.98         7.10         7.19         7.15         6.94         7.12         7.20         ND           4200         4000         4100         3700         3500         3500         3400         800           4800         4900         620         620         620         620         620         620         620         620         620         620         620         620								
ND         ND         ND         ND         ND         ND         ND           94         95         96         93         94         93         93         93           94         95         96         93         94         93         93         93           ND         ND         ND         ND         ND         ND         ND         ND           1800         1800         1800         1600         1400         1400         1300           3.4         3.0         2.5         3.0         3.4         3.5         3.5           17         18         18         14         12         12         11           ND         ND         ND         ND         ND         ND         ND           6.98         7.10         7.19         7.15         6.94         7.12         7.20           4200         4000         4100         3700         3600         3500         3400           640         620         640         530         470         450         450           4900         4900         5200         4200         3800         3600         3600 <td>93 94</td> <td>63</td> <td>93</td> <td>85</td> <td>96</td> <td>110</td> <td>110</td> <td>100</td>	93 94	63	93	85	96	110	110	100
ND         ND         ND         ND         ND         ND         ND           94         95         96         93         94         93         93         93           ND         ND         ND         ND         ND         ND         ND         ND           1800         1800         1800         1600         1400         1400         1300           3.4         3.0         2.5         3.0         3.4         3.5         3.5           17         18         18         14         12         12         11           ND         ND         ND         ND         ND         ND         ND           6.98         7.10         7.19         7.15         6.94         7.12         7.20           4200         4000         4100         3700         3600         3500         3400           640         650         640         530         470         450         450           4900         4900         5200         4200         3800         3600         3600	<u>9</u>	2	QN	2	2	Q	Q	9
94         95         96         93         94         93         93           ND         ND         ND         ND         ND         ND         ND           1800         1800         1800         1600         1400         1300           3.4         3.0         2.5         3.0         3.4         3.5         3.5           17         18         18         14         12         12         11           ND         ND         ND         ND         ND         ND           6.98         7.10         7.19         7.15         6.94         7.12         7.20           4200         4000         4100         3700         3800         3400         800           4200         640         620         640         530         470         450         450           4900         4900         5200         4200         3800         3600         3600	Q Q	2	QN	9	Q	Q	Q	2
ND   ND   ND   ND   ND   ND   ND   ND	93 34	93	93	85	90	110	110	100
1800         1800         1800         1600         1400         1400         1300           3.4         3.0         2.5         3.0         3.4         3.5         3.5         3.5           17         18         18         14         12         12         11         11           ND         ND         ND         ND         ND         ND         ND         ND           6.98         7.10         7.19         7.15         6.94         7.12         7.20           4200         4100         3700         3600         3500         3400           640         620         640         530         470         450         450           4900         4900         5200         4200         3800         3500         3600	QN QN	Q	QN	Q	2	2	9	9
3.4         3.0         2.5         3.0         3.4         3.5         3.5           17         18         18         14         12         12         11           In         17         18         18         14         12         12         11           In         In <td< td=""><td>1600 1400</td><td></td><td>1400</td><td>1500</td><td>960</td><td>2000</td><td>1800</td><td>1800</td></td<>	1600 1400		1400	1500	960	2000	1800	1800
17         18         18         14         12         12         11         11           ND         ND         ND         ND         ND         ND         ND         ND           6.98         7.10         7.19         7.15         6.94         7.12         7.20           17.8         16.8         16.6         16.9         17.1         17.4         17.4           4200         4000         4100         3700         3600         3500         3400           640         620         640         5200         4200         3800         3500         3600	3.4		3.7	3.1	4.4	3.80	3.80	3.80
Ial         17         18         18         14         12         12         11         11           ND         ND         ND         ND         ND         ND         ND         ND           6.98         7.10         7.19         7.15         6.94         7.12         7.20           17.8         16.8         16.6         16.9         17.1         17.4           4200         4100         3700         3500         3400           640         620         640         530         470         450         450           4900         5200         4200         3800         3500         3600	14 12	-	13	≨	NA	ΑN	Ϋ́	¥
ND         ND<	14 12	-	13	12	4.5	4	12	5
6.38         7.10         7.19         7.15         6.94         7.12         7.20           17.8         16.8         16.6         16.9         17.1         17.4           4200         4000         4100         3700         3600         3400           640         620         640         530         470         450         450           4900         5200         4200         3800         3500         3600         3600	QN QN	9	Q	¥N	NA	Ą	¥	¥
17.8         16.8         16.6         16.6         16.9         17.1         17.4           4200         4000         4100         3700         3600         3500         3400           640         620         640         530         470         450         450           4900         4900         5200         4200         3800         3500         3600	7.15 6.94		7.16	7.27	7.67	7.45	7.41	7.45
4200         4000         4100         3700         3600         3500         3400           640         620         640         530         470         450         450           4900         4900         5200         4200         3800         3500         3600	16.6 16.9		18.2	19.3	19.7	19.6	19.5	19.5
640         620         640         530         470         450         450           4900         4900         5200         4200         3800         3500         3600	3700 3600		3800	4000	2600	3200	3200	3100
4900 4900 5200 4200 3800 3500 3600	530 470	450	490	044	250	630	650	630
	4200 3800	3600	4100	3200	1900	3800	3700	3700
Total Suspended Solids 22 21 21 15 21 13 17	15 21	17	17	QN	ND	16	17	99

ND = Not detected NA = Not analyzed

Table 2

# Middle Well Groundwater Quality Data

Analyte	W-2 950	W-2 830	W-2 950   W-2 830   W-2 680   W-2 530   W-2 480	W-2 530	W-2 480	W-2 375	W-2 320	W-2 Composite	W-2 Constant-1	W-2 Constant-2	W-2 2,500	W-2 3,500	W-2 5,000
AZ Metals Package													
Aluminum	0.059	0.12	0.11	0.036	2	0.026	0.044	0.039	S	QV	0.15	Q	0.37
Antimony	2	2	2	2	2	9	2	Q	S	Q	2	2	2
Arsenic	2	£	₽	2	2	2	2	Q	0.0032	0.0036	0.0050	0.0049	0.0070
Barium	0.18	0.18	0.17	0.21	0.17	0.16	0.15	0.15	0.11	0.056	0.13	0.14	0.16
Beryllium	2	£	윤	2	2	2	2	Q	Q	S	9	Ş	2
Cadmium	2	Ş	£	2	2	2	2	Q	S	2	9	운	2
Calcium	290	470	400	540	400	450	440	410	320	180	420	410	380
Chromium	0.0063	2	2	2	2	2	2	Q	Ð	2	2	0.0043	0.0076
Copper	0.092	0.023	0.011	0.0051	0.0048	0.0039	0.0039	0.10	0.022	0.0053	0.019	0.020	0.10
Iron	0.50	1.2	0.1	0.70	0.43	0.11	0.21	0.068	0.1	0.055	0.64	0.25	98.0
Lead	Q	2	2	2	2	2	2	0.059	0.0057	0.0074	0.0068	0.0051	0.016
Magnesium	8	<b>5</b> 8	24	30	23	21	20	23	16	8.3	24	25	ន
Manganese	0.026	0.0098	0.0078	0.0047	0.0027	2	0.0030	Q	Q	QN	0.012	0.0030	0.023
Mercury	2	2	ð	2	2	2	9	Q	QN	Q	2	2	2
Molybdenum	0.0080	0.0077	0.0080	0.0062	0.0072	0.0089	0.0084	0.0091	0.0094	0.019	0.0086	0.0091	0.0069
Nickel	2	2	₽	Ş	9	9	2	N	9	Q.	2	운	2
Potassium	27	23	22	56	21	20	19	21	18	13	22	ន	52
Selemium	2	2	₽	2	2	2	9	QN	0.0073	0.0030	0.011	0.011	0.011
Silica	20	19	19	20	19	18	19	19		17	21	ឧ	21
Sodium	1020	096	850	1100	850	840	790	860	780	500	860	900	830
Thallium	2	2	₽	ę	9	2	2	QV	Q.	Q	2	₽	2
Vanadium	2	9	0.0033	9	S	QN	9	0.0027	0.0032	0.0036	0.0037	0.0036	0.0043
Zinc	1.3	0.91	0.55	0.28	0.29	0.24	0.22	S	2	Q	0.39	0.070	0.071

ND = Not detected NA = Not analyzed

Table 3

### **Groundwater Quality Data** Well W72-10

Analytes	W72-10 850	W72-10 850 W72-10 770	<b>-</b> 1	W72-10 580	W72-10 450	W72-10 400	W72-10 360	M72-10 700 W72-10 580 W72-10 450 W72-10 400 W72-10 360 W72-10 Composite	W72-10 Start	W72-10 Start   W72-10 Stop
Inorganic Non-Metals										
Alkalinity - Bicarbonate	88	06	89	87	82	ಜ	87	110	110	110
Alkalinity - Carbonate	2	9	2	2	2	2	2	Q.	2	2
Alkalinity - Hydroxide	2	₽	2	2	2	2	2	2	2	9
Alkalinity, Total	68	8	89	87	82	83	87	110	110	110
Ammonia, as N	2	₽	2	Q	2	Q	2	2	2	2
Chloride	980	910	950	920	850	930	930	1000	1100	096
Fluoride	2.8	2.9	2.6	2.9	3.0	2.9	2.8	2.5	2.3	2.6
Nitrate, as N	¥	ž	¥	Ą	Ϋ́	ž	ž	NA	3.	¥
Nitrate/Nitrite as N, Total	80.	60 10.00	3.8	3.4	2.9	2.7	3.9	5.0	5.4	4.0
Nitrite, as N	¥	¥	2	AN	NA	ΑΝ	₹	≨	2	ď
Hď	7.60	7.53	7.48	7.47	7.29	7.55	7.50	7.36	7.22	7.35
pH Temperature	19.8	19.6	19.7	19.9	19.8	19.8	20.0	19.9	19.0	20.1
Specific Conductance	2700	2600	2600	2500	2400	2400	2500	2900	3000	3000
Sulfate	250	250	260	230	220	220	240	330	330	310
Total Dissolved Solids	1700	1700	1700	1600	1600	1500	1700	2000	2000	1900
Total Suspended Solids	35	ON	Q	22	2	Q	QN	99	350	17

ND = Not detected NA = Not analyzed

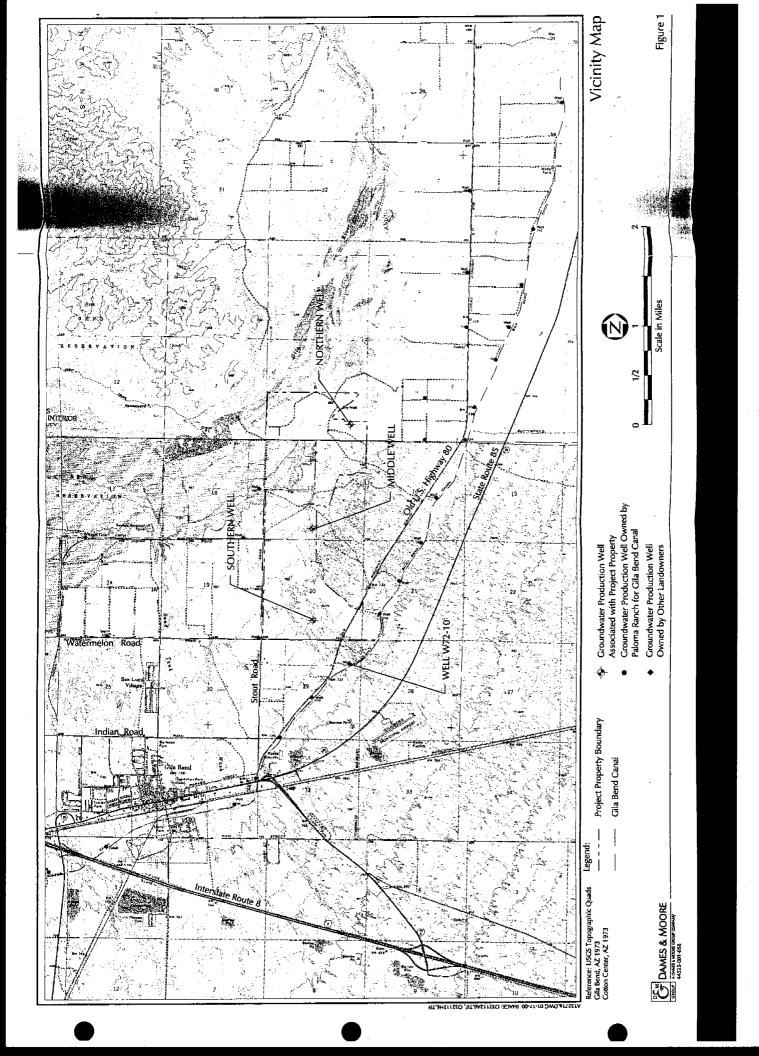
P:V44525\001\WaterSupply\Table 3

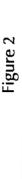
Table 3

## Well W72-10 Groundwater Quality Data

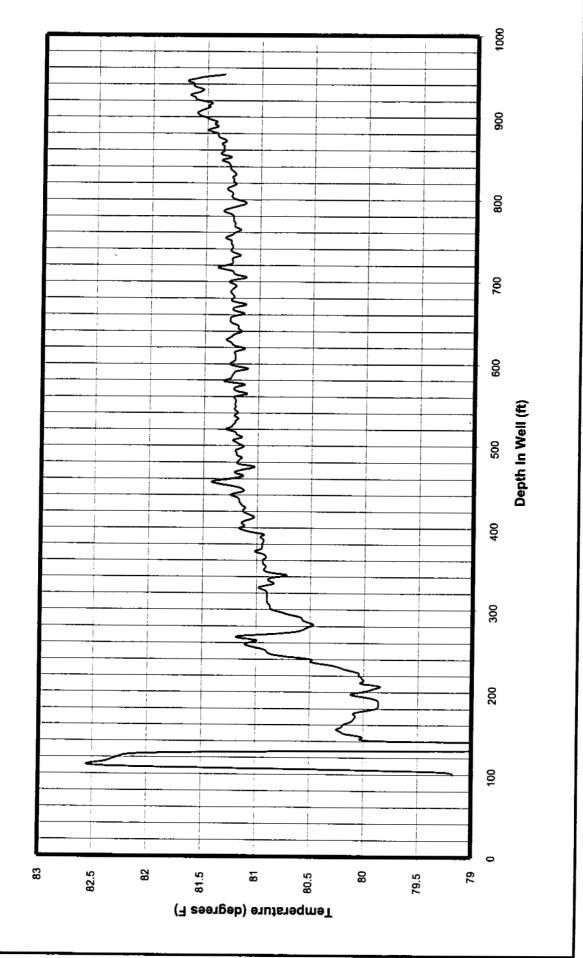
Analytes	W72-10 B50	W72-10 850 W72-10 770	W72-10 700	W/Z-10 560	100 OL-7/M	M/2-10 400	W/2-10 300	W/Z-10 560 W/Z-10 450 W/Z-10 400 W/Z-10 360 W/Z-10 Composite	W72-10 Start	W72-10 Start   W72-10 Stop
AZ Metals Package										
Aluminum	0.084	0.10	0:050	0.14	0.11	0.040	0.10	0.19	4.3	0.28
Antimony	9	9	2	Q	9	Q	2	2	Q	2
Arsenic	0,010	0.0054	0.0049	0.0047	0.0057	0.0059	0.0059	0.0053	0.0085	2
Barium	0.055	0.073	0.075	0.070	0.065	0.068	0.085	0.080	0.16	0.079
Benyllium	2	2	2	Q	2	2	2	9	2	2
Cadmium	2	9	2	Q	2	2	2	2	2	9
Calcium	130	130	140	120	110	120	140	170	170	150
Chromium	0.029	0.013	0.0074	0.0093	0.0064	0.0078	0.0066	0.0046	0.0095	0,0056
Copper	0.095	0.028	0.031	990:0	0.017	0.019	0.032	0.013	0.19	0.056
Iron	4.30	1.7	1.7	1.4	0.69	0.75	0.67	0.40	5.9	0.38
Lead	0.0086	0.0054	0.0039	0.0061	0.0034	0.0039	0.0032	0.0084	0.025	9
Magnesium	8.4	4	5.6	5.1	4.7	4.7	5.5	7.5	6.6	5.0
Manganese	0.084	0.11	0.11	0.10	0.082	0.077	0.0520	0.040	0.22	0.017
Mercury	2	2	2	2	9	2	Q	9	2	2
Molybdenum	0.0110	0.0094	0.010	0.0097	0.011	0.011	0.0098	0.0063	0.0067	0.0071
Nickel	9	2	2	Q	S	9	2	S	Q	2
Potassium	-	12	12	12	=	12	12	13	41	12
Selenium	0.0051	0.0068	0.0039	0.0028	0.0032	0.0029	0.0054	0.0065	0.0061	2
Silica	18	82	19	80	18	18	18	20	23	8
Sodium	470	510	520	490	490	510	530	540	540	530
Thallium	2	9	2	9	9	Q	Q	Q	Ð	2
Vanadium	0.0029	9	0.0024	0.0025	0.0026	0.0027	0.0024	0.0031	0.012	0.0024
Zinc	0.070	0.054	0.061	0.17	2	Q	0.053	9	0.057	윤

### **FIGURES**

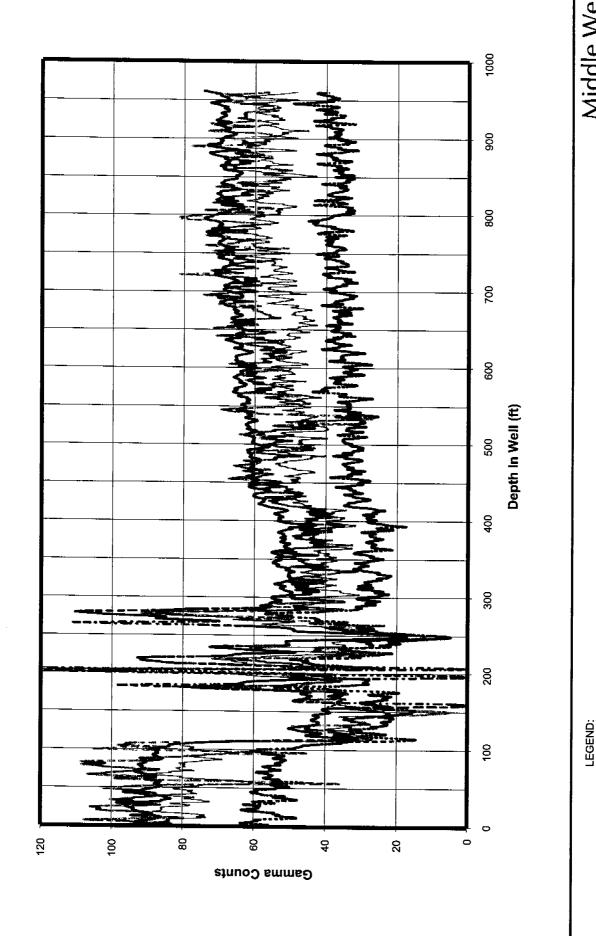




DAMES & MOORE ELECT ATTENDED TO THE ATTENDED T



Middle Well Temperature Log

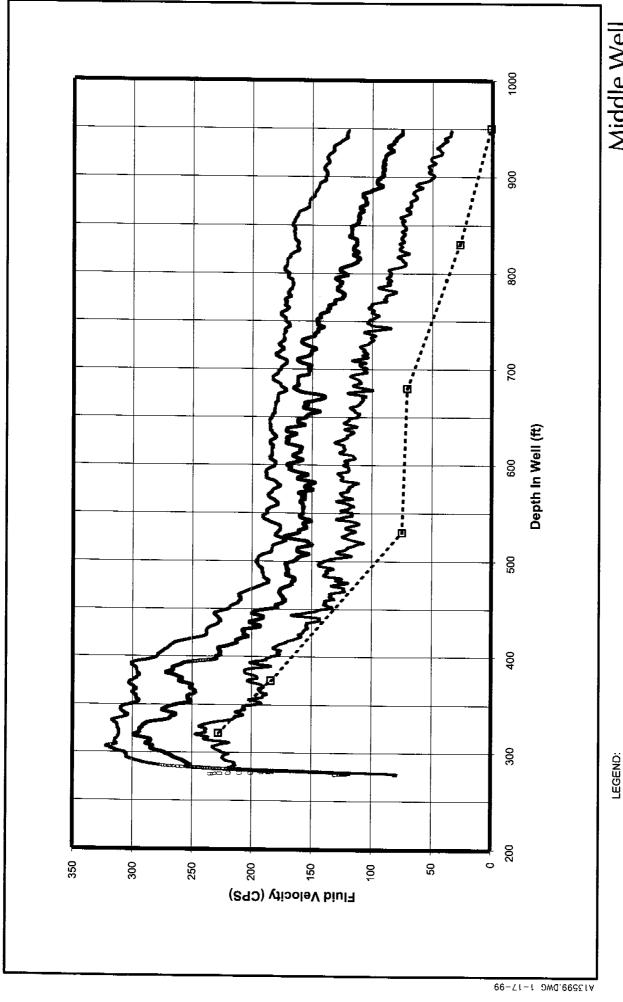


Middle Well Spectral Gamma Log Figure 3

DAMES & MOORE
GROUP ADMES & MOORE
44525-001-056

- Thorium - Total Gamma

Potassium
Uranium



Middle Well Dynamic Flowmeter Log

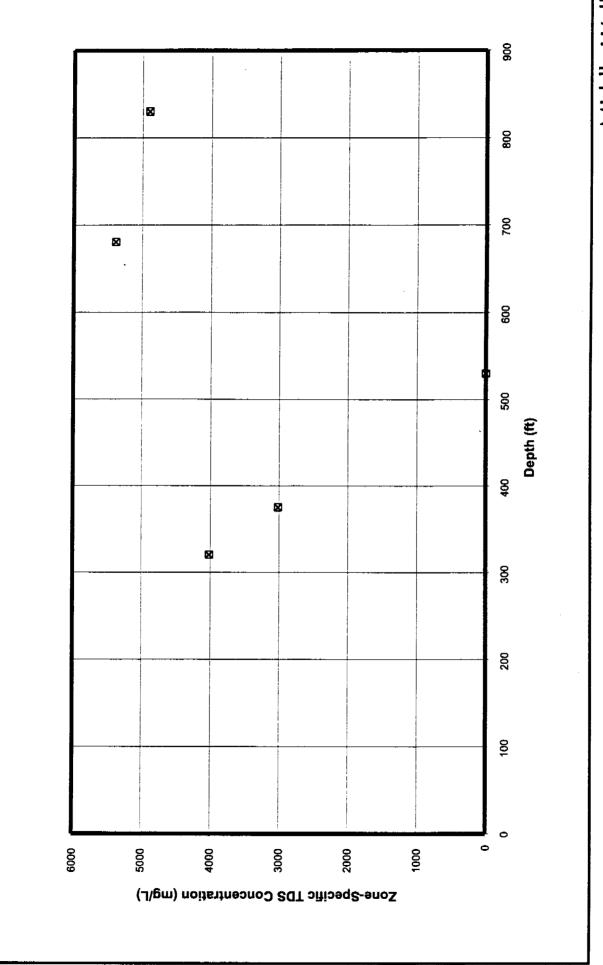
Figure 4

DAMES & MOORE GROUP CAMONY 44225-001-058

-- - Stop Counts

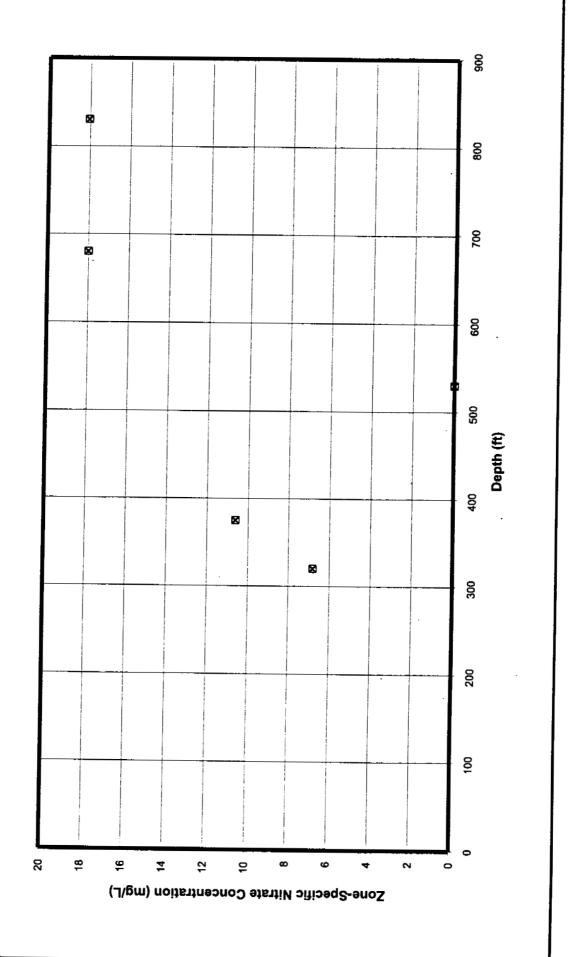
60 ft/min 30 ft/min

90 ft/min

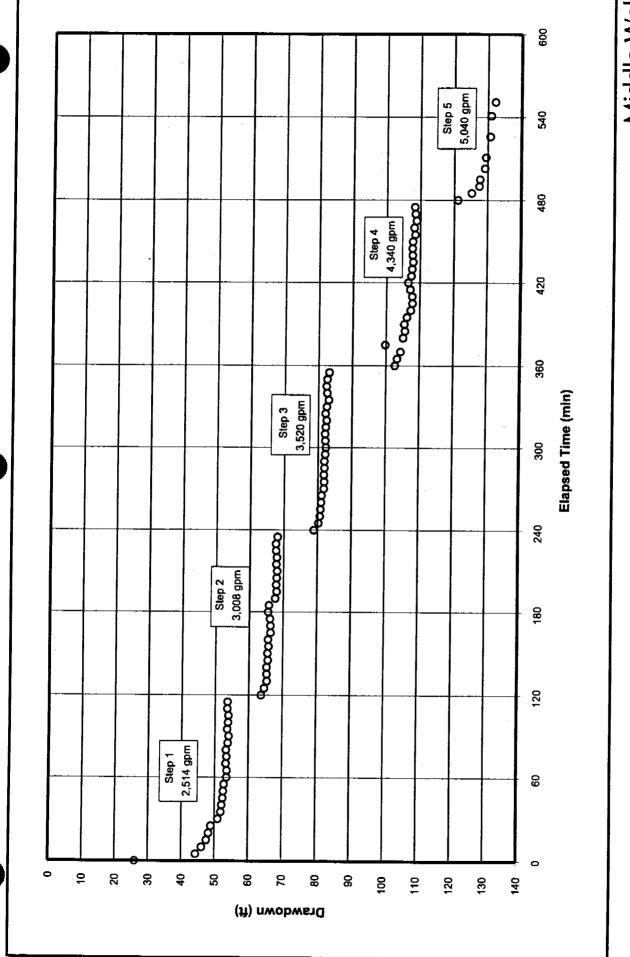


Middle Well Zonal TDS Concentrations

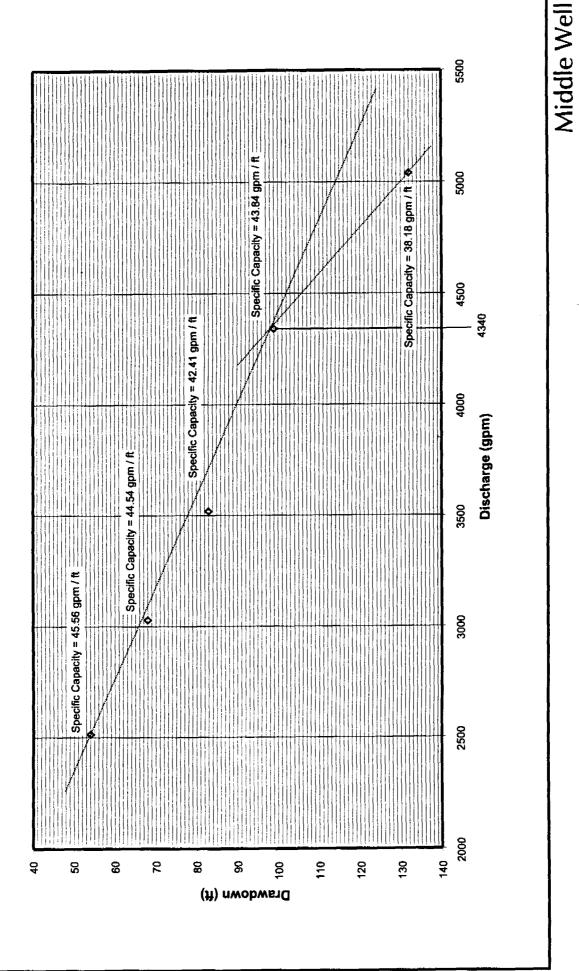
DAMES & MOORE



Middle Well Zonal Nitrate Concentrations

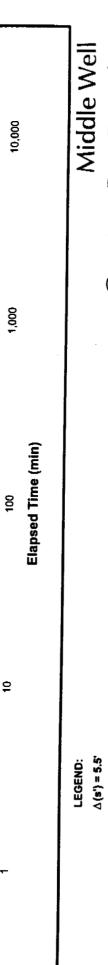


Middle Well Step-Drawdown Test Plot



# Discharge Versus Drawdown Plot





Constant-Rate Test Plot

Figure 9

T = (264Q) / ∆(s') = 194,400 gpd/ft Q = 4050 gpm

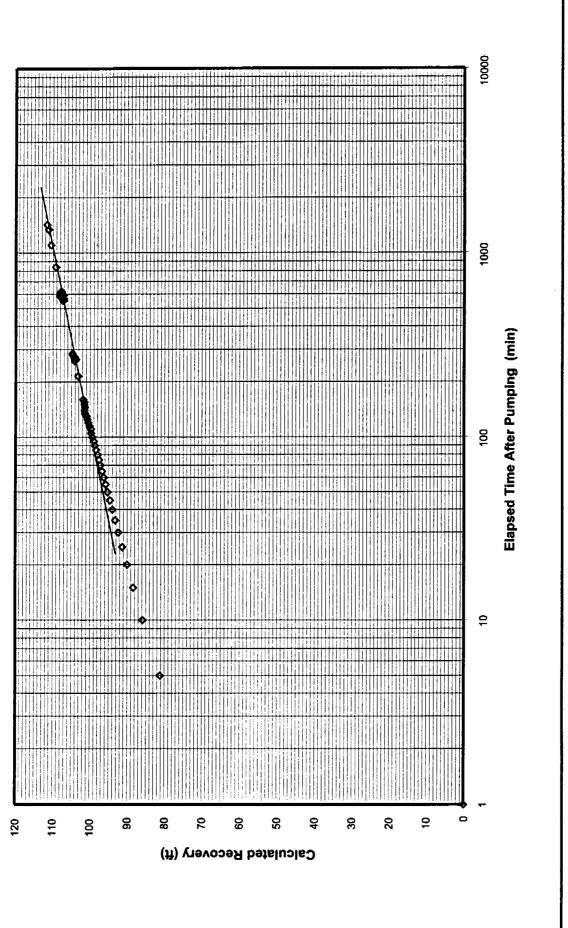
DAMES & MOORE STORY ADMITTANCE CHOST COMMANDE CHOST COMMAND CHOST COMMAND CHOST COMMAND CHOST CH

V12604, DWC 1-17-99

O

S

Drawdown (ft)



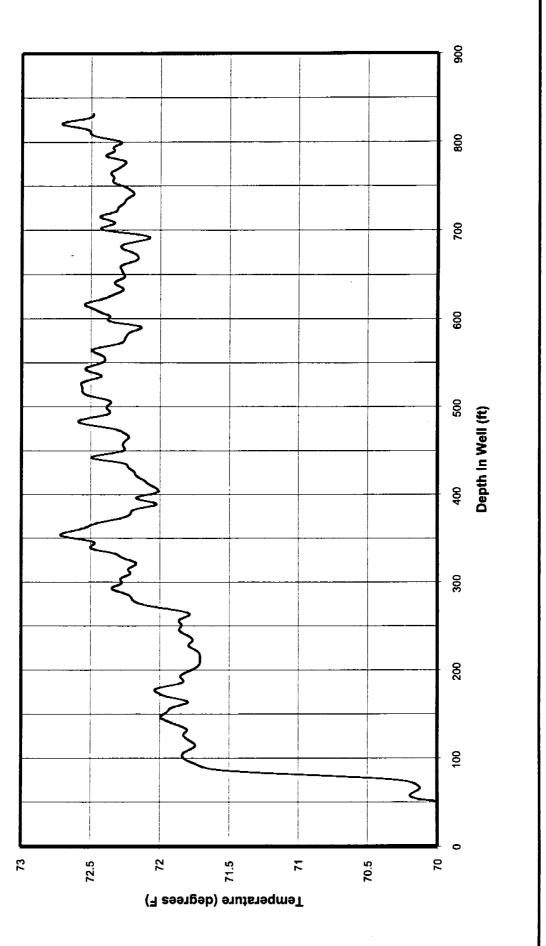
Middle Well Recovery Test Plot

Figure 10

 $T = (264Q) / \triangle(s-s")$ = 106,920 gpd/ft

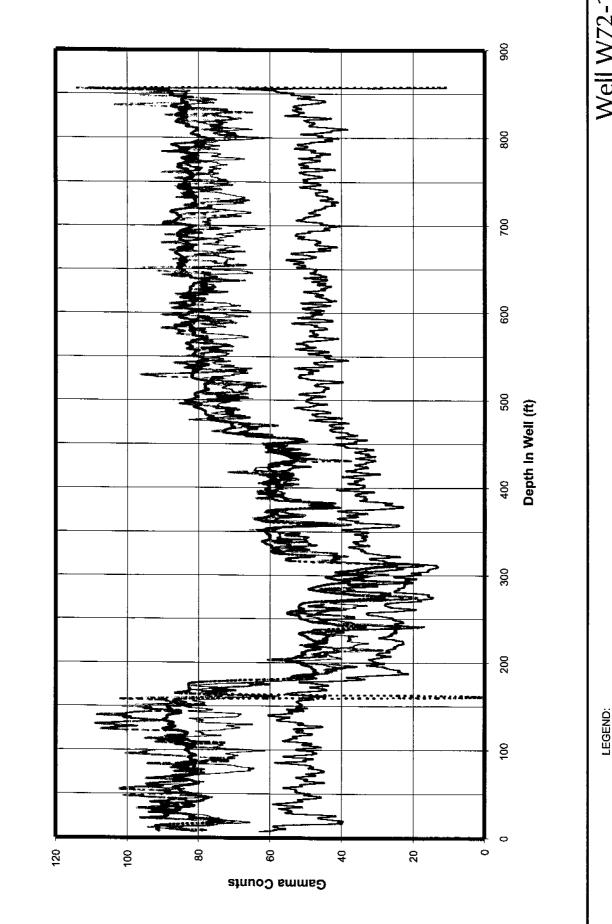
∆(s-s') = 10° Q = 4050 gpm





Well W72-10 Temperature Log

DAMES & MOORE COOL TO A TOWER MOORE 4825-001-058



Well W72-10 Spectral Gamma Log

Figure 12

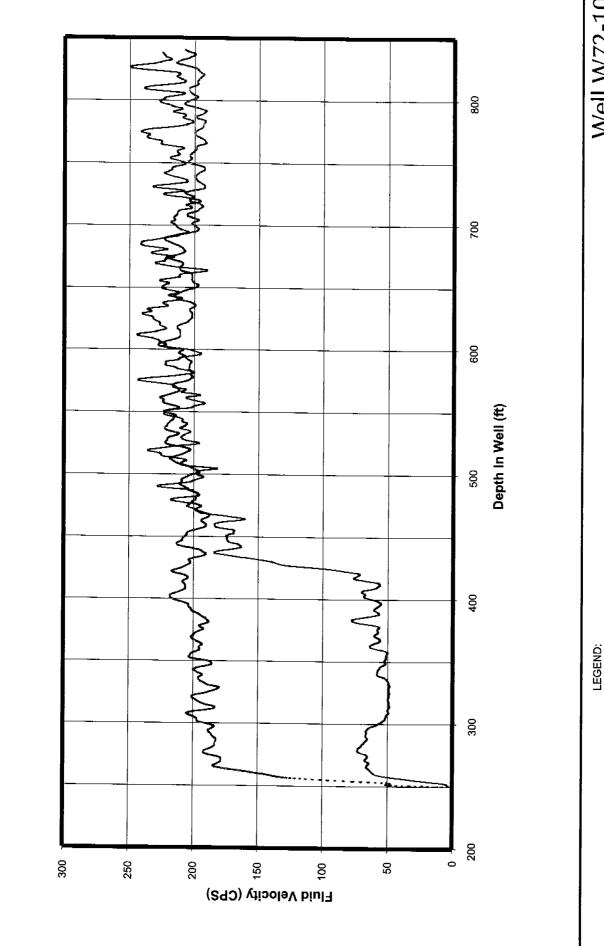
DAMES & MOORE

FROM A LANGE GROUP COMPANY

44225-001-058

Total Gamma

-- Potassium -- Uranium -- Thorium

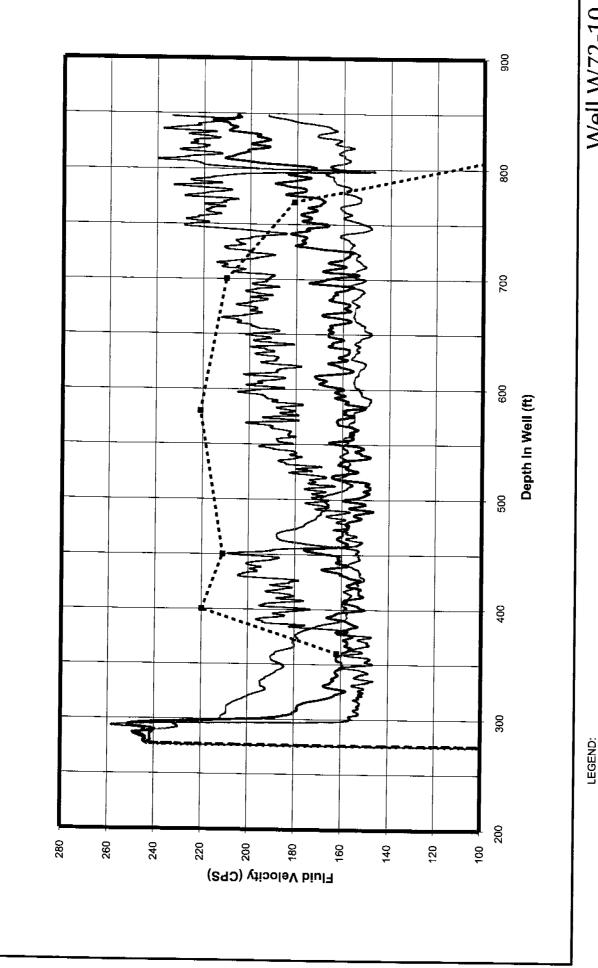


Well W72-10 Static Flowmeter Log

Figure 13

— 60 ft/min — 90 ft/min

DAMES & MOORE GROEF COMMONS A 44525-001-058



Well W72-10 Dynamic Flowmeter Log

Figure 14

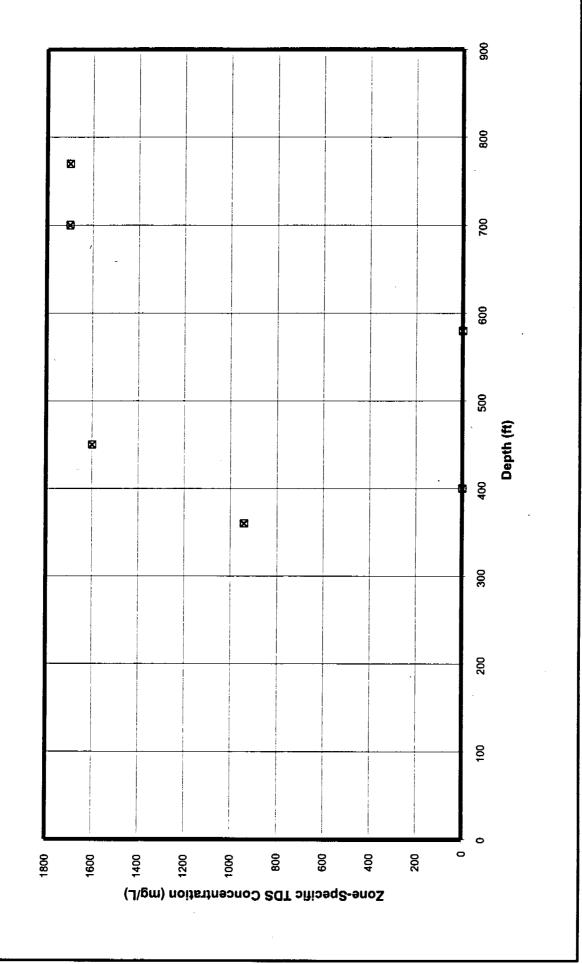
DAMES & MOORE GROUP TOWNS A MOORE 44525-001-058

Stop Counts

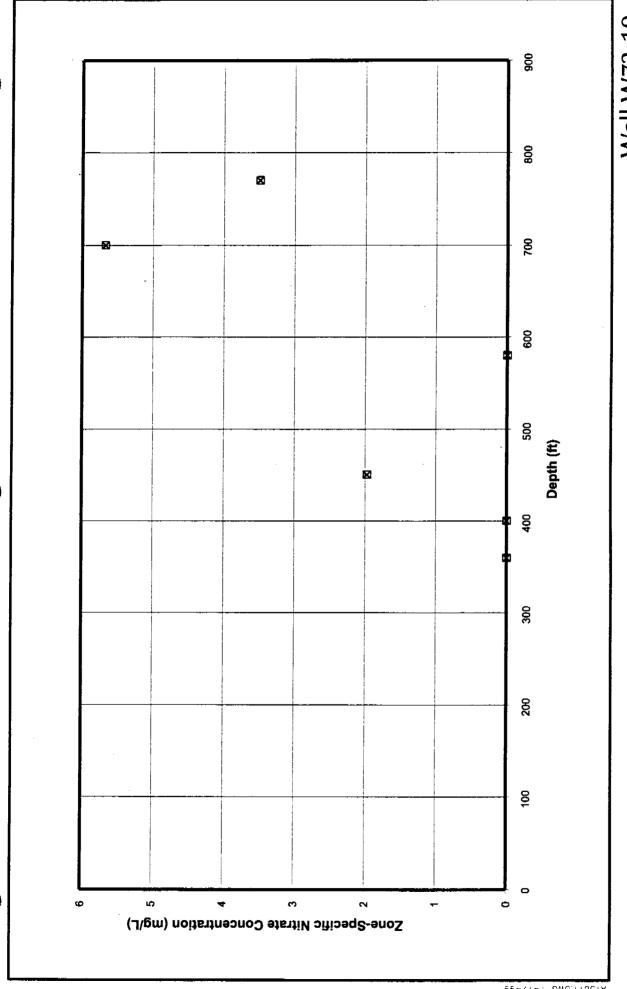
•

90 ff/min

30 ft/min 60 ft/min



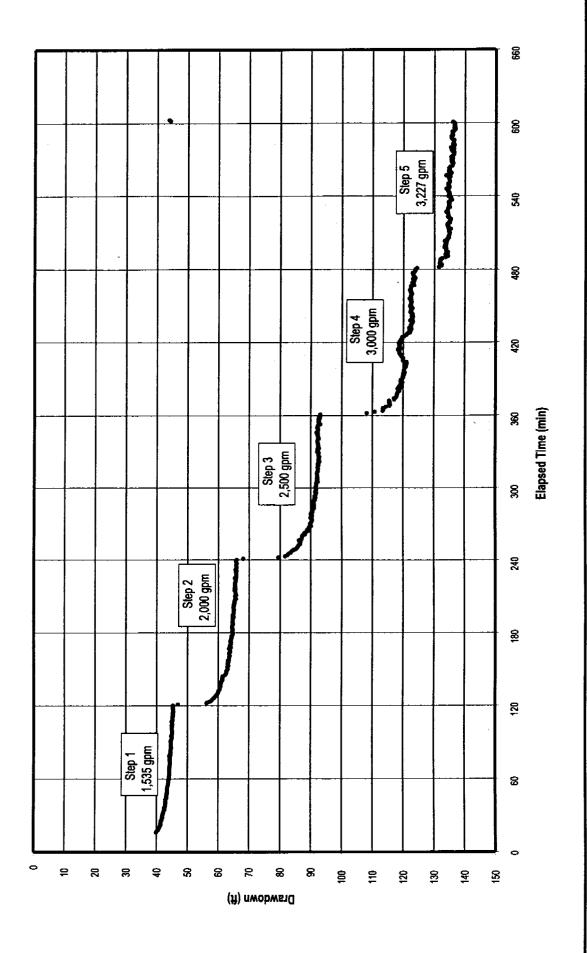
Well W72-10 Zonal TDS Concentrations



Well W72-10 Zonal Nitrate Concentrations

Figure 16

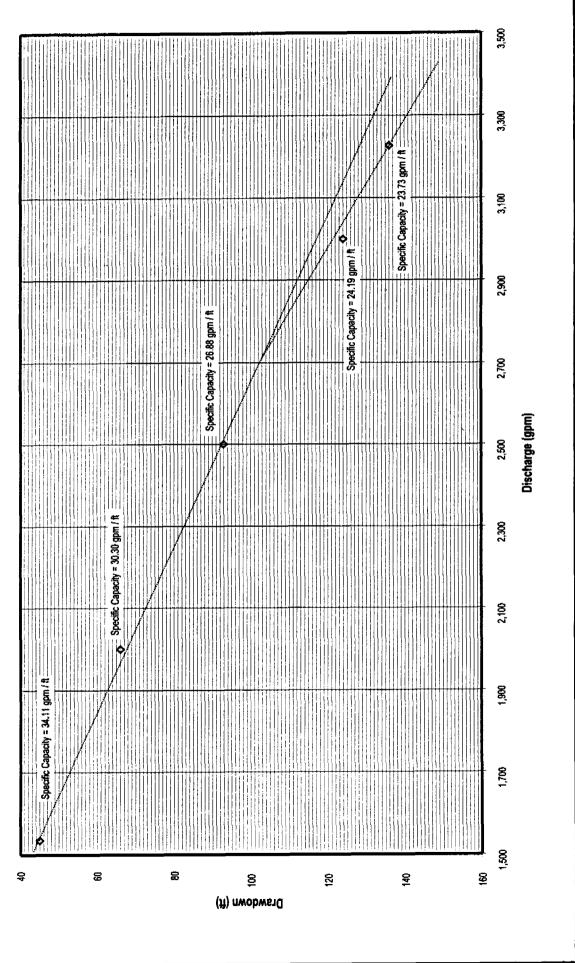
DAMES & MOORE GOOD TO THE MOORE HOLD COMMY 4825-001-058



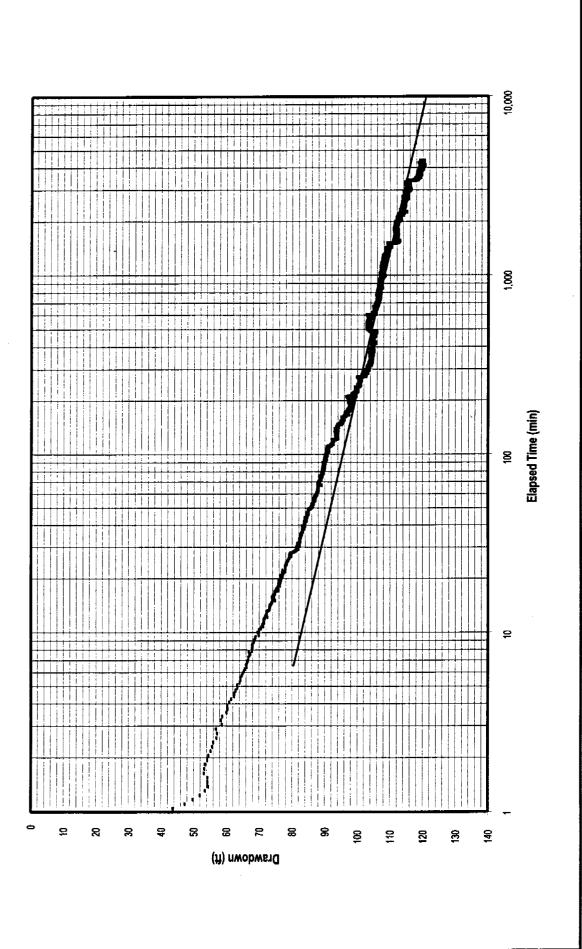
Well W72-10 Step-Drawdown Test Plot

Figure 17

DAMES & MOORE



# Well W72-10 Discharge Versus Drawdown Plot

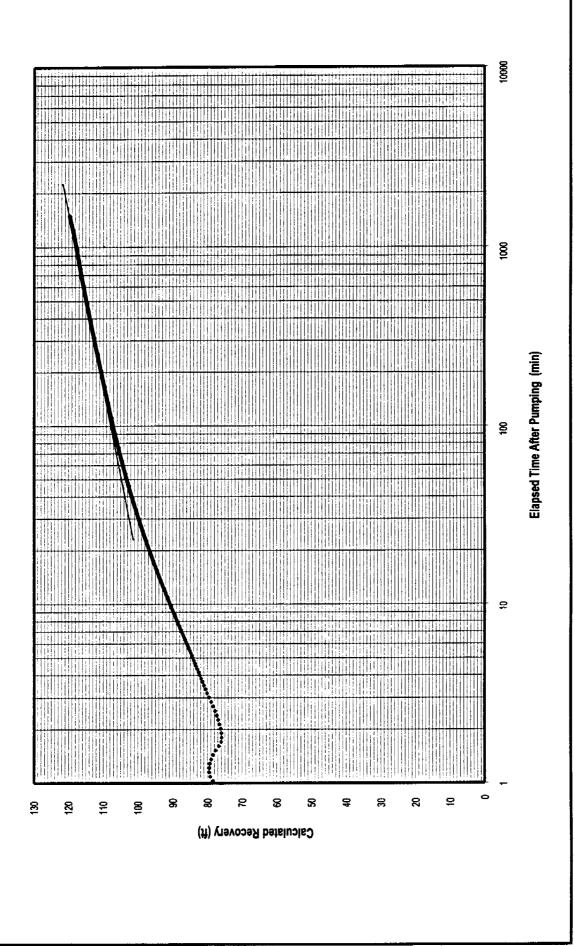


Well W72-10 Constant-Rate Test Plot

Figure 19



LEGEND:  $\Delta$  (s') = 12' Q = 2.750 gpm  $T = (264Q) / \Delta$  (s') = 60,500 gpd/ff



Well W72-10

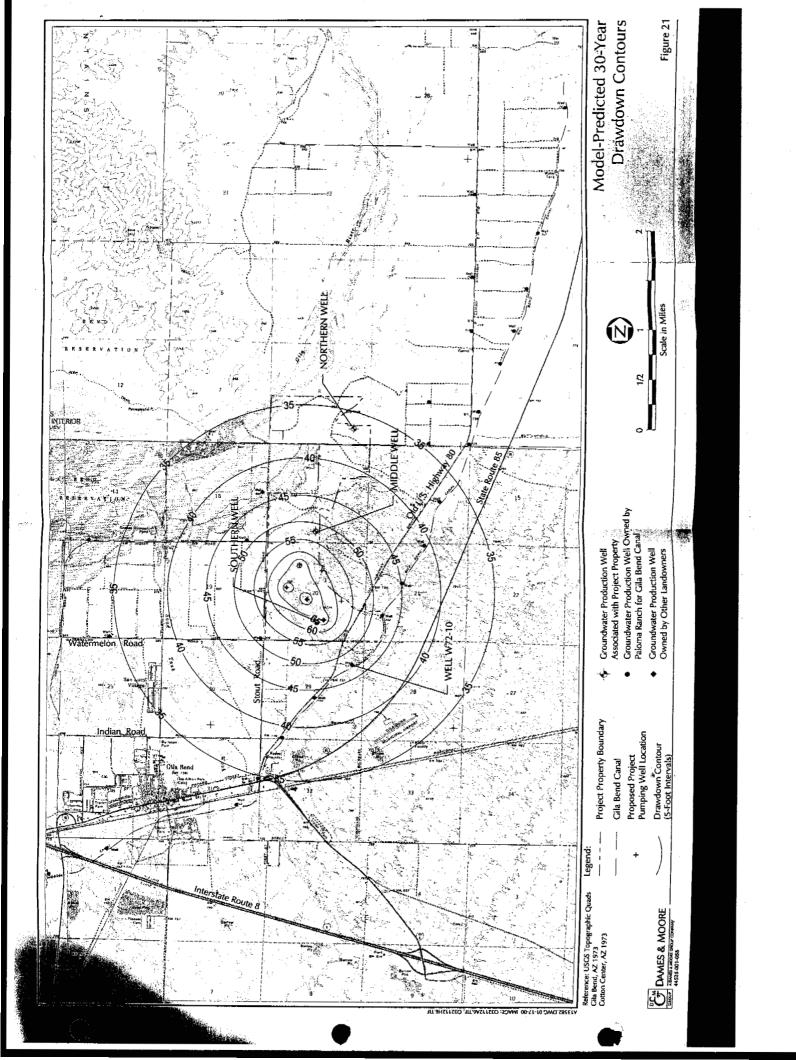
Recovery Test Plot

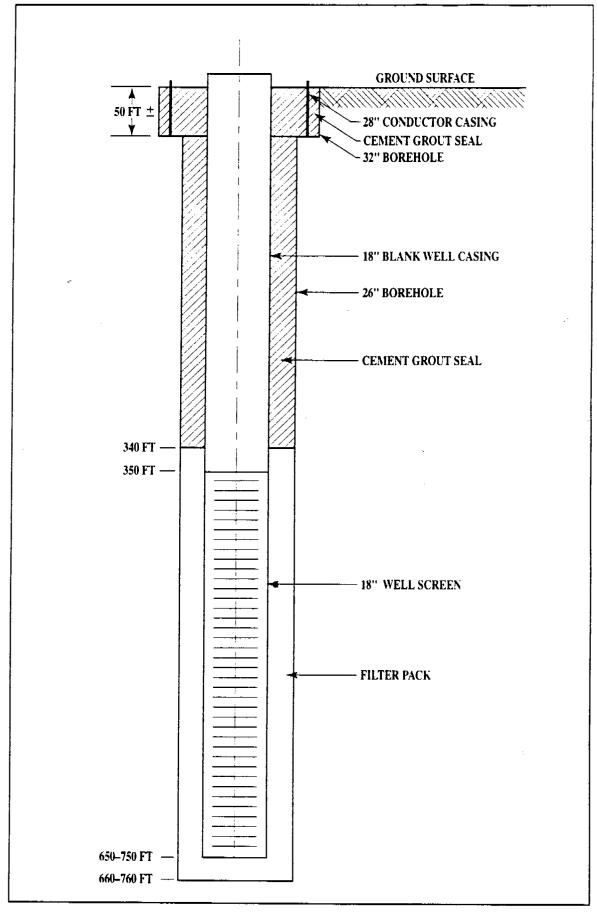
Figure 20

DAMES & MOORE

Δ(s-s') = 10' Q = 2,750 gpm T = (264Q) / Δ(s-s') = 72,600 gpd/ft

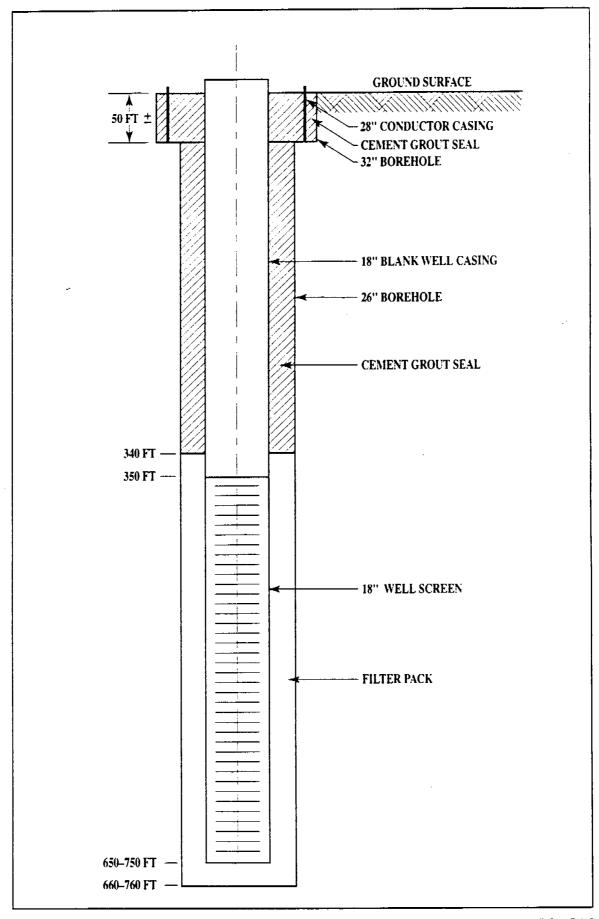
LEGEND:





# PRELIMINARY PRODUCTION WELL DESIGN

PHASE II WATER SUPPLY INVESTIGATION PANDA GILA RIVER PROJECT



# PRELIMINARY PRODUCTION WELL DESIGN

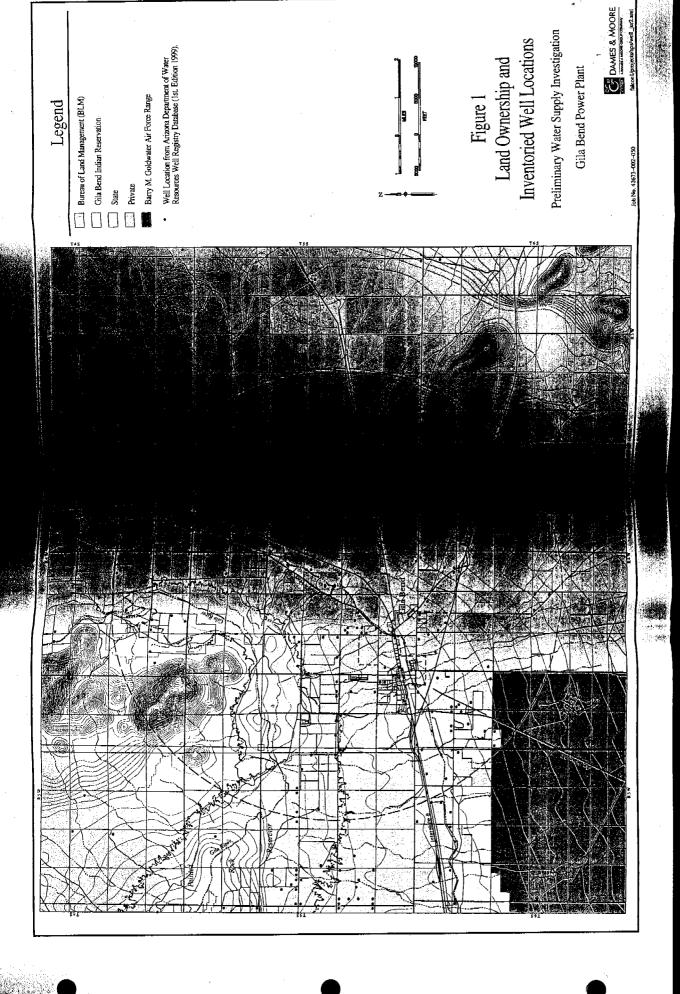
PHASE II WATER SUPPLY INVESTIGATION PANDA GILA RIVER PROJECT

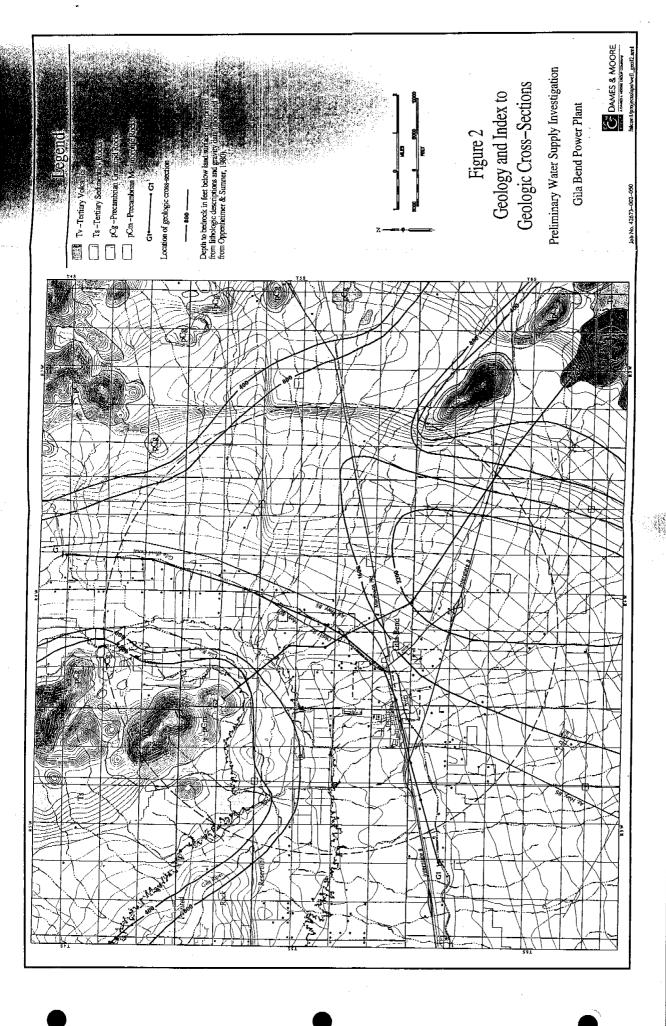


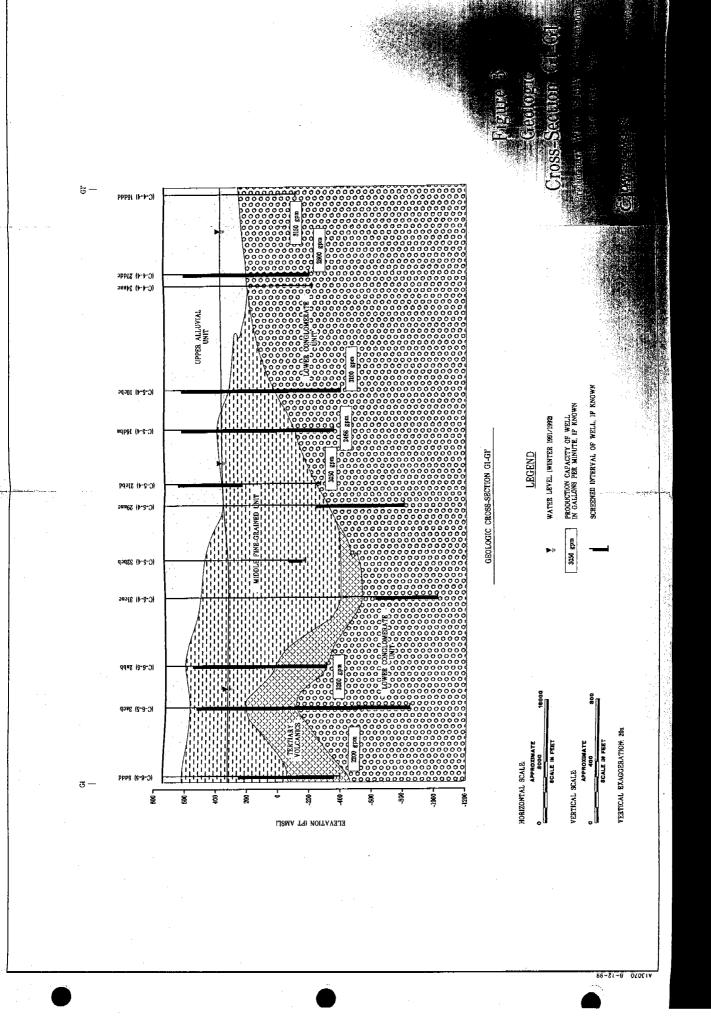
### APPENDIX A

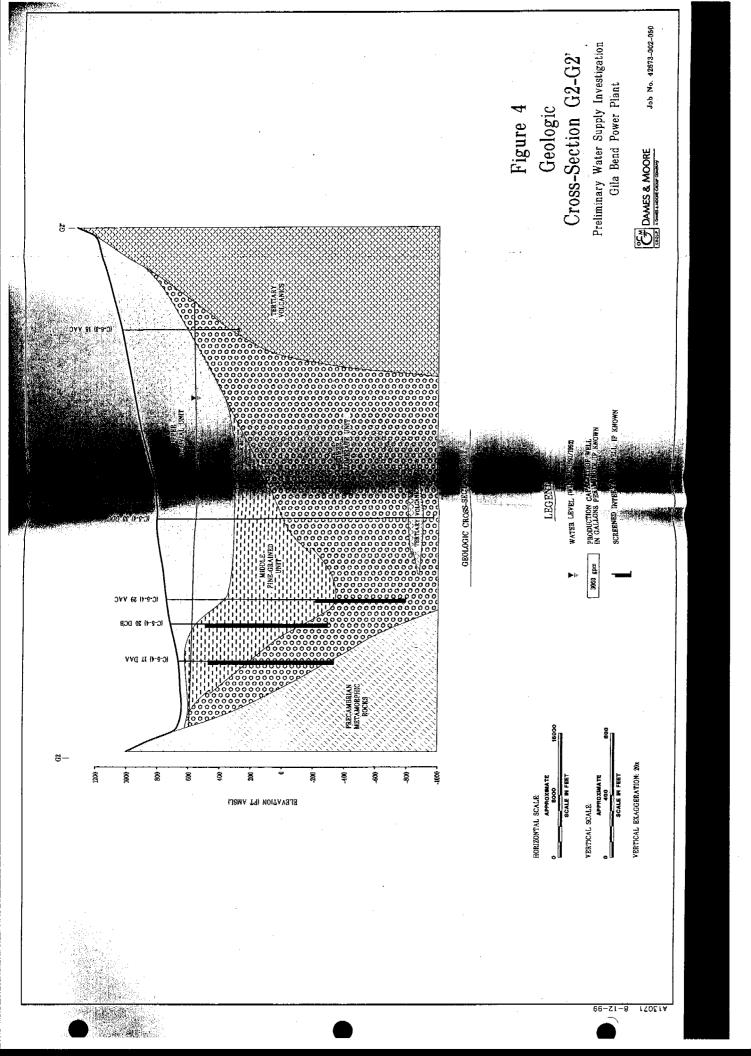
## SELECTED FIGURES FROM THE

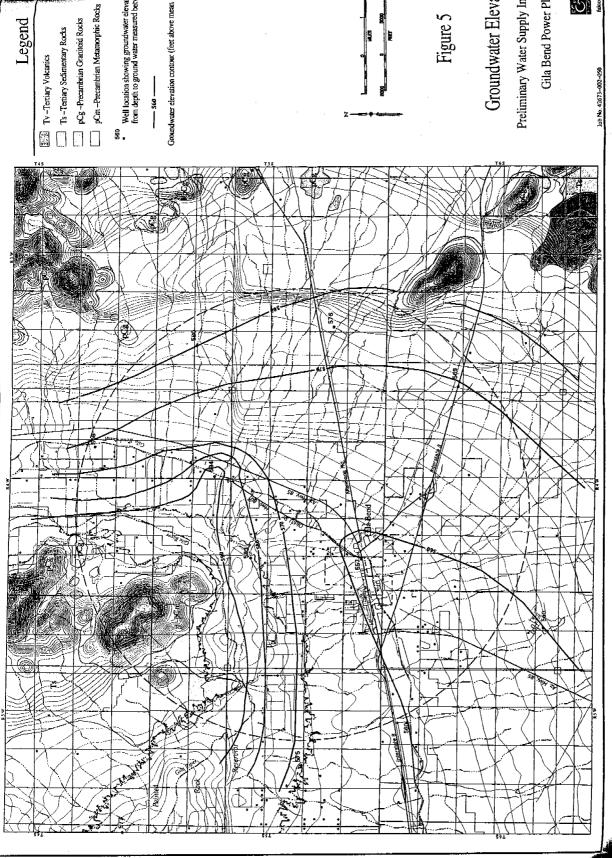
# PRELIMINARY WATER SUPPLY INVESTIGATION REPORT











Legend

Well location showing groundwater elevation calculated from depth to ground water measured between 1993 and 1998.

Groundwater elevation contour (feet above mean sea level).

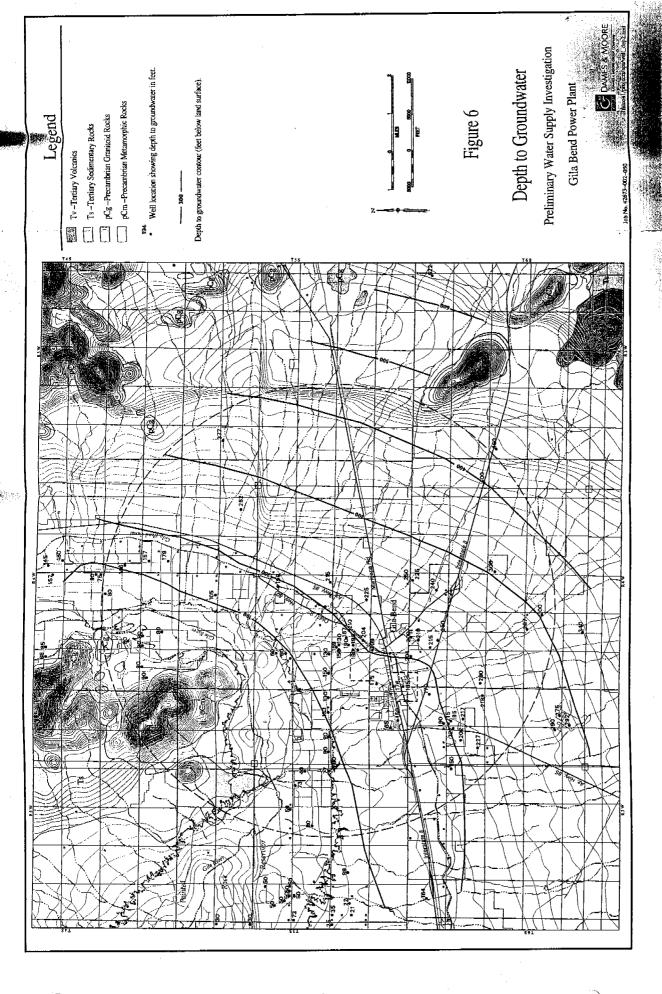
Figure 5

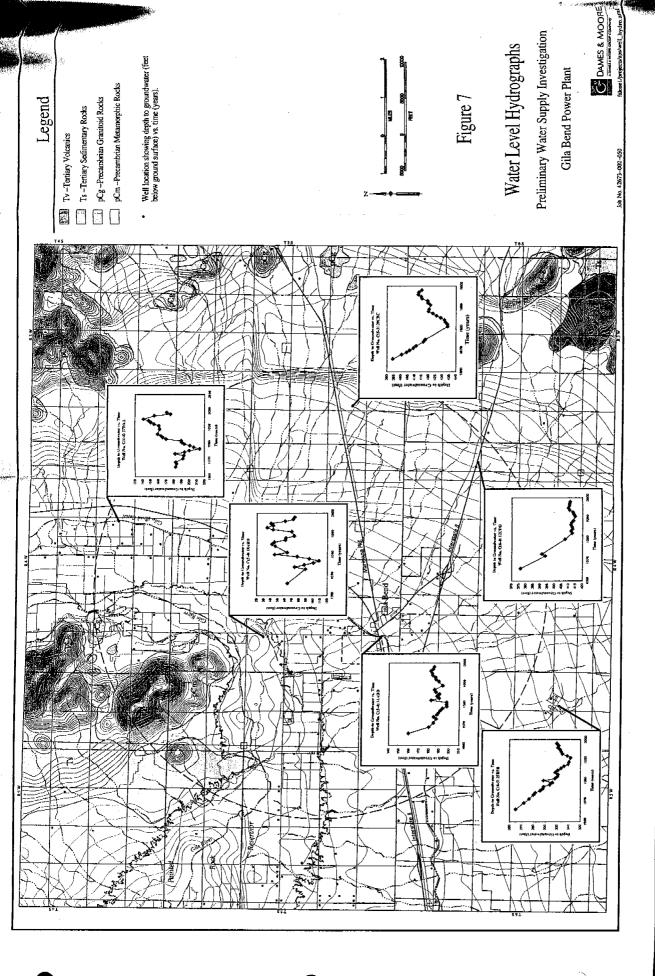
Groundwater Elevations

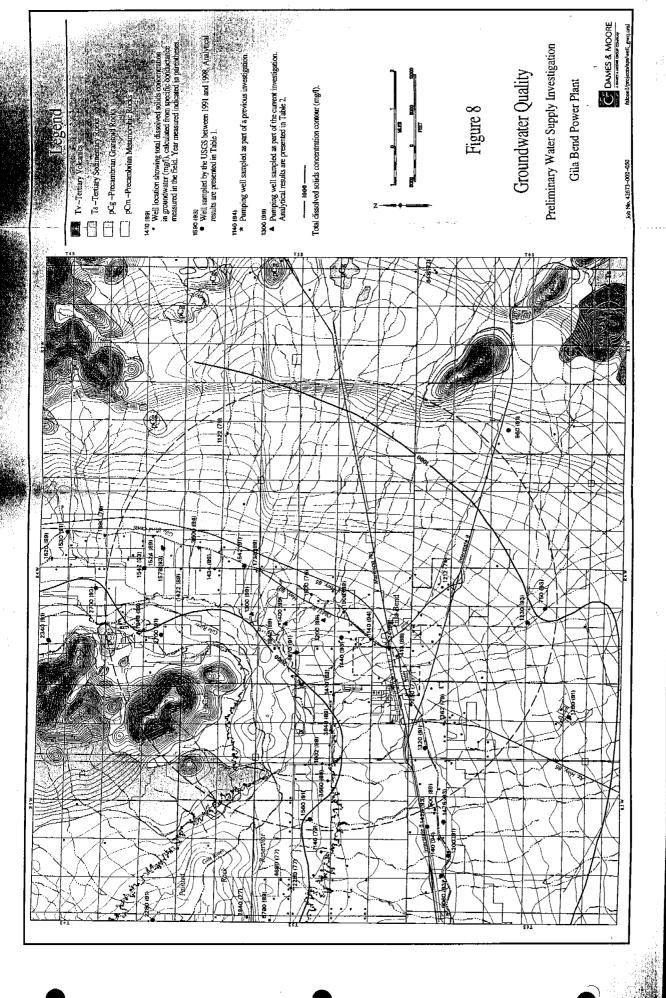
Preliminary Water Supply Investigation

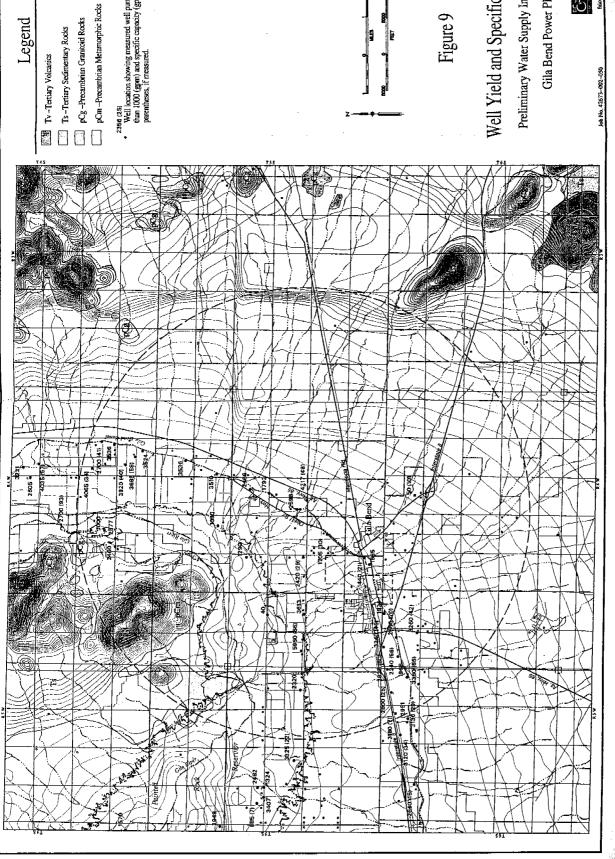
Gila Bend Power Plant

DAMES & MOORE









Legend

2356 (25)

Well Location showing measured well purmprate greater than (100 (gpm) and specific capacity (gpm/ft) in parentheses, if measured.

Figure 9

Well Yield and Specific Capacity

Preliminary Water Supply Investigation

Gila Bend Power Plant

DAMES & MOORE

# CULTURAL RESOURCE SURVEY FOR THE PROPOSED PANDA GILA RIVER PROJECT

### prepared for

Environmental Planning Group, Inc. 4350 East Camelback Road, Suite G-200 Phoenix, Arizona 85018

## prepared by

A.E. (Gene) Rogge Suzanne M. Lewenstein Matthew E. Hill, Jr. Dames & Moore 7500 N. Dreamy Draw Drive, Suite 145 Phoenix, Arizona 85020

January 2000

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\* distribution of this map is limited because of sensitive information about the location of archaeological sites that are subject to vandalism but is available upon request to appropriate agency reviewers

### **ABSTRACT**

Report Title

and Date:

Cultural Resource Survey for the Proposed Panda Gila River Project

January 2000

Agency:

Arizona Power Plant and Transmission Line Siting Committee of the

Arizona Corporation Commission

**Survey Permit** 

Number:

None required

**Project Number:** 

Dames & Moore Job Number 44525-003-050

**Project** 

**Description:** 

Panda Gila River, L.P. plans to submit an application to the Arizona Power Plant and Transmission Line Siting Committee of the Arizona Corporation Commission for a Certificate of Environmental Compatibility for construction of the Panda Gila River Project. The project will include four natural gas-fueled, combined-cycle units having a total nominal capacity to generate 2,000 megawatts. Other plant facilities include cooling towers, a switchyard, a well field, tanks, administration and warehouse buildings, parking lots, and a laydown area for temporary use during construction. An evaporation pond covering as much as 70 acres also may be required.

Location and Ownership:

The project site is in west-central Maricopa County within Section 20 of Township 5 South, Range 4 West, Gila and Salt River Base Line and Meridian. The project site is private land within the incorporated area of the Town of Gila Bend, which is currently rezoning Section 20 to industrial use.

Acreage:

The applicant owns approximately 475 acres of land within Section 20, including about 335 acres of farmland and 140 acres of undeveloped desert land. The footprint of the proposed plant and adjacent switchyard encompasses approximately 60 acres. A larger parcel of about 255 acres was intensively surveyed for cultural resources to include a buffer for ancillary facilities.

Personnel:

Matthew E. Hill, Jr. directed the field survey, and was assisted by archaeologists Douglas C. Avann, Carmen Costner, Rachel Davies, Cara Lonardo, and Robert Sherman. Dr. A.E. (Gene) Rogge served as principal investigator.

### Dates of Field Survey:

The fieldwork was conducted on 15 December 1999. Six person-days of effort were devoted to the fieldwork.

### Register Eligible Sites:

No archaeological or historical sites were discovered within the surveyed parcel. For approximately 15 years, the Town of Gila Bend has been planning the development of the nearby Gatlin Site (also designated as archaeological site AZ Z:2:1 [ASM]) as a cultural park. This Hohokam ceremonial village site was first recorded in 1957 and partially excavated in 1958-1959 in conjunction with studies conducted to mitigate the impacts of constructing Painted Rocks Dam. The site was designated a National Historic Landmark in 1964 and subsequently listed on the National Register of Historic Places in October 1966. Visual and noise impacts on this site are addressed.

### Register Ineligible Resources:

Four isolated occurrences of archaeological artifacts were found and recorded within the survey parcel. These isolated occurrences include small scatters of two to eight sherds of broken Hohokam ceramic vessels, and a flaked core tool.

Recommendations: No significant archaeological or historical properties appear to be threatened by ground-disturbing activities associated with the proposed development of the Panda Gila River Project. Although the proposed plant will conform to land use plans, potential visual and noise intrusions could occur within the setting of the proposed but not yet funded or developed Gatlin Site Cultural Park. Panda Gila River, L.P. currently is working with the Town of Gila Bend to develop measures to mitigate the potential visual and noise intrusions. These measures could include sensitive coloring of the plant and related facilities, vegetative screening, and perhaps construction of earthen berms to provide additional buffering.

> If any human remains or funerary objects were to be unexpectedly discovered, they should be reported to the director of the Arizona State Museum in accordance with Arizona Revised Statutues §§ 41-865. As more detailed plans are developed for the plant and related facilities, additional cultural resource inventory survey may be warranted.

### **ACKNOWLEDGMENTS**

We thank Ed McDaniel of Panda International and Garlyn Bergdale, Jennifer Donahue, and Randy Palmer of Environmental Planning Group, who coordinated our involvement in this project. We gratefully acknowledge the efforts of crew members Doug Avann, Carmen Costner, Rachael Davies, Cara Lonardo, and Robert Sherman without whom we could not have completed the field survey. We also appreciate the cooperation and efforts of the staff members who maintain files at the State Historic Preservation Office, Arizona State Museum, Arizona State University Anthropology Department, Pueblo Grande Museum, Museum of Arizona, and Bureau of Land Management. We also appreciate the efforts of Ron Savage who prepared the report graphics and Keryn Darr who edited the report.

## CULTURAL RESOURCE INVENTORY FOR THE PROPOSED PANDA GILA RIVER PROJECT

### INTRODUCTION

The Arizona Corporation Commission Rules of Practice and Procedure stipulate that power plants with a nameplate rating of 100 megawatts (MW) or more and costing \$50,000 or more can be built only if the Commission's Power Plant and Transmission Line Siting Committee issues a Certificate of Environmental Compatibility (CEC). Panda Gila River, L.P. is proposing to construct the Panda Gila River Project and plans to submit an application for a CEC. The Siting Committee's rules stipulate that CEC applications are to include an Exhibit E describing "any existing scenic areas, historic sites and structures or archaeological sites in the vicinity of the proposed facilities and state the effects, if any, the proposed facilities will have thereon" (R14-3-219). This report has been prepared to address that requirement.

The Arizona State Historic Preservation Act of 1982 stipulates that state agencies such as the Arizona Corporation Commission consider impacts of their programs on historical properties in consultation with the State Historic Preservation Office (SHPO). This report also is intended to support the Commission's consultations with the SHPO about the proposed Panda Gila River Project.

this Project involves no federal funding or federal rights-of-way and is not considered to be a "federal undertaking." Thus, there is no requirement to comply with federal regulations for *Protection of Historic Properties* (36 CFR Part 800), which implement Section 106 of the National Historic Preservation Act.

### **Project Description**

The proposed Gila River Panda Project would have four natural gas-fueled, combined-cycle units. Each of these units would have the capacity to generate 500 MW of electrical energy for a total nominal capacity of 2,000 MW for the entire power plant. Ancillary facilities at the plant site would include cooling towers, a switchyard, a well field, tanks, administration and warehouse buildings, parking lots, and a laydown area for temporary use during construction. An evaporation pond covering as much as 70 acres also may be required.

Construction of the first generation unit is scheduled to begin in 2000, and all four units are scheduled to be operating by 2003. The project is designed to use the latest combined-cycle generating technology to produce reliable and low-cost electrical power, and minimize environmental impacts.

### **Project Location**

The project site is approximately 50 miles southwest of central Phoenix in west-central Maricopa County within Section 20 of Township 5 South, Range 4 West, Gila and Salt River Base Line

and Meridian (Figure 1). The project site is within the incorporated area of the Town of Gila Bend, which is currently rezoning Section 20 to industrial use. The footprint of the proposed plant and adjacent switchyard encompasses approximately 60 acres within the SW1/4 of Section 20 (Figure 2). All of Section 20 is private land, and the applicant owns approximately 475 acres within this section, including about 335 acres of farmland and 140 acres of undeveloped desert land (Figure 3).

### **Scope of Survey**

A parcel of about 255 acres in Section 20 was intensively surveyed for cultural resources to encompass the proposed plant site and switchyard and a buffer for related facilities. Because the land is privately owned, no survey permit was required.

A crew of six archaeologists conducted the survey on 15 December 1999, devoting a total of six person days of effort to the fieldwork. Matthew E. Hill, Jr. directed that fieldwork, and was assisted by archaeologists Douglas C. Avann, Carmen Costner, Rachel Davies, Cara Lonardo, and Robert Sherman. Dr. A.E. (Gene) Rogge served as principal investigator for the study.

Portions of the evaporation pond siting area and the temporary construction lay down area were not intensively surveyed. No archaeological or historical sites have been previously recorded within these unsurveyed areas. Both of these areas are in agricultural fields and, as documented later in this report, no archaeological or historical resources were noted within the fields that were intensively surveyed. The potential for significant archaeological or historical resources being present in the unsurveyed areas is low

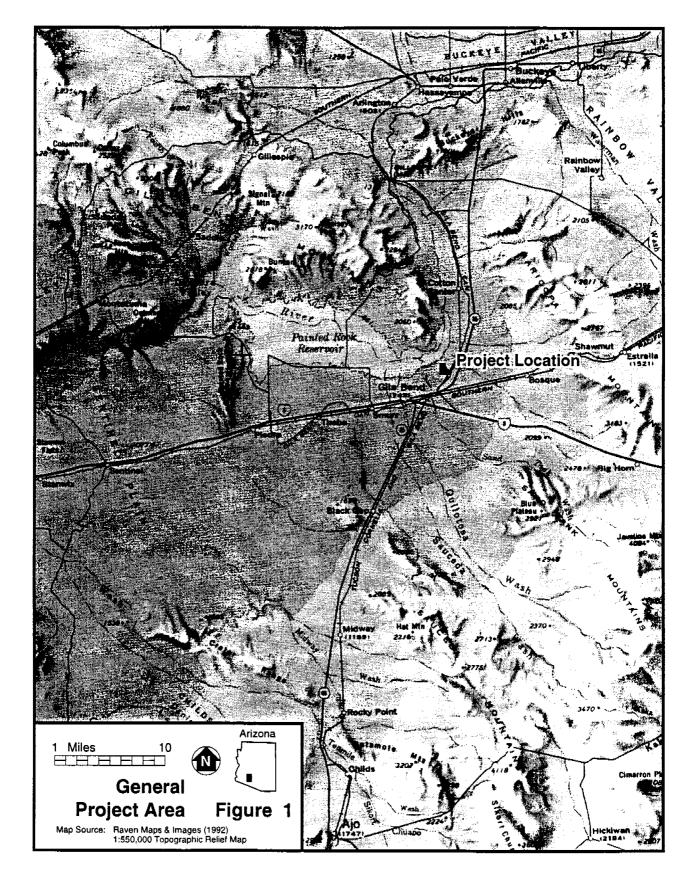
### **ENVIRONMENTAL SETTING**

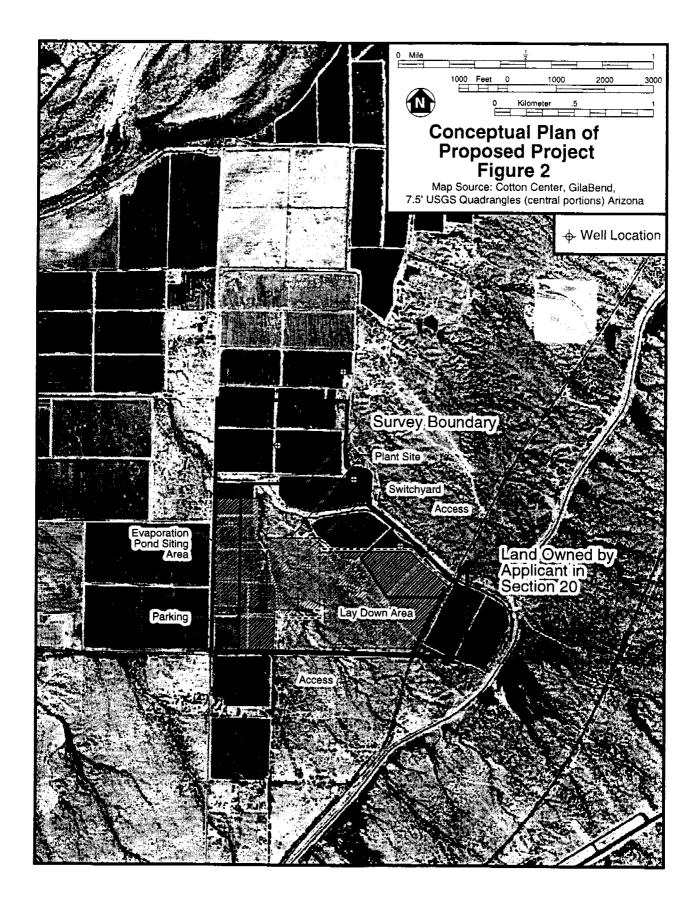
The project area is adjacent to the Gila River within the Sonoran biotic province of southwestern Arizona. The natural environment of the project area has been substantially altered in historical times by agricultural development and damming of rivers in the Gila River drainage. Despite the desert environment, native peoples found game and native plant foods within the region, and were able to irrigate fields on the floodplain and terraces of the Gila River.

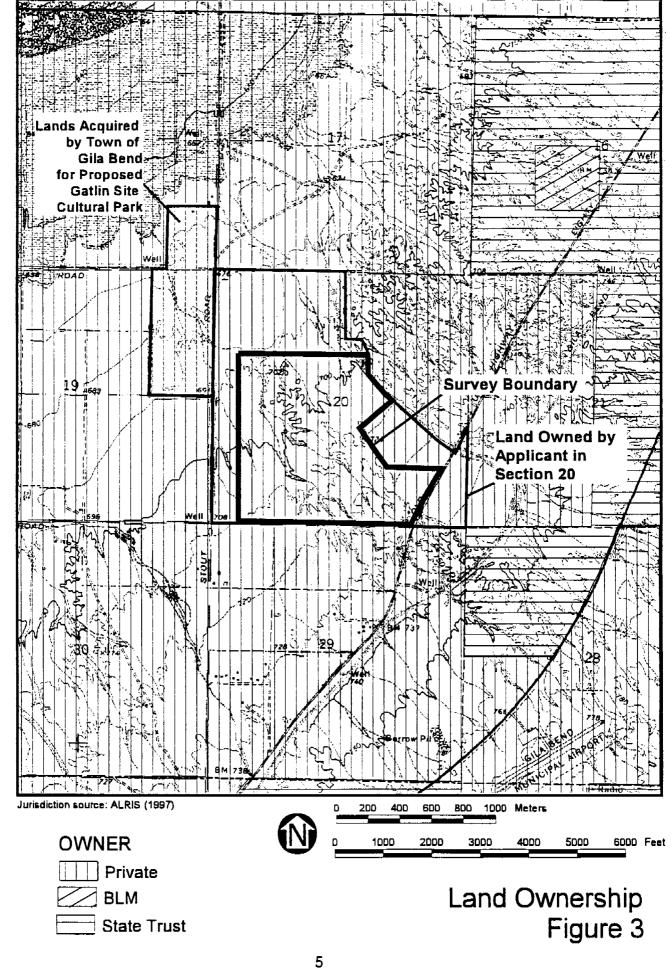
### Climate

The climate of the project area is hot and arid. Annual precipitation is biseasonal, averaging only about 5 to 6 inches (13 to 15 centimeters) (Sellers and Hill 1974). During the winter, widespread frontal precipitation systems that last for several days pass through the region. In contrast, the summer monsoon season usually brings brief, localized, and violent thunderstorms during July and August. Rainfall is rare during spring and autumn.

Summer temperatures are hot, with average daily highs exceeding 100 degrees Fahrenheit (°F) (38 °Centigrade [C]) from June through September. Winter temperatures are mild, and daily







highs average almost 70 °F (21 °C) in December and January, the coolest months. These temperatures result in an exceptionally long growing season. Typically temperatures drop below freezing on only about 20 days between late November and early March.

### Physiographic Setting

The project area is located in southwestern Arizona on the south side of the Gila River. Elevations within the study area range from about 650 to 735 feet (198 to 224 meters) above sea level. The Gila Bend Mountains on the north side of the Gila River attain elevations of about 3,200 feet (975 meters) and the Sand Tank Mountains about 25 miles (40 kilometers) to the southeast reach elevations of about 4,000 feet (1,220 meters). The area is drained by unnamed ephemeral washes that flow northwest to the Gila River. Some of northern parcels of farmland purchased for the project are within the Gila River floodplain and the flood pool behind Painted Rocks Dam. The southern part of the project lands grades into low ridges on the floor of the Gila River Valley. Patches of moderately developed desert pavement are present within a triangular area of about 139 acres of project lands that have not been developed for agriculture.

The Gila River, originating in the mountains of southwestern New Mexico, is one of the major drainage systems of the southwestern United States. The river makes a sharp curve to the south to flow around the Gila Bend Mountains and this bend is the source of the name of the mountains and the town of Gila Bend. Historical accounts indicate that prior to the construction of dams, the flows of the Gila were substantial and perennial (see Wasley and Johnson 1965:3). For example, in November 1697 Captain Juan Mateo Manje (account published in 1954) indicated a ship could be navigated all the way upstream to the confluence with the San Pedro River. In the 1820s, mountain man James Ohio Pattie had to build a canoe to cross the river because it was too deep and wide to ford with a horse (Thwaites 1905). Emory (1848) described the river as a 100 yards wide to the east of Gila Bend, and in 1876 Hinton (account published in 1954) described the river west of Gila Bend as 600 feet wide and 3 to 5 feet deep.

### Natural Vegetation and Wildlife

The project area is within the Lower Sonoran desert scrub life zone (Turner and Brown 1994). A lush, narrow band of riparian habitat would have been present along the Gila River prior to construction of upstream dams. The native cottonwood and willow trees that would have lined the river have been mostly replaced by invasive, non-indigenous salt cedar. The adjacent floodplains and low river terraces would have been covered with saltbush, creosote bush, or mesquite.

No native vegetation remains on those portions of the project area that have been developed for agriculture, but a triangular area of about 140 acres in the southern part of the project area retains natural vegetation (Figures 4 and 5). This vegetation community is typical of the Lower Colorado River Valley Subdivision of Sonoran Desertscrub (Turner and Brown 1994). This community is dominated by creosote bush with scattered honey mesquite, rayless encelia, and bursage. The deeper washes through the area are incised about 3 to 6 feet (1 to 2 meters), and



Figure 4. Overview of Natural Vegetation Within the Project Area (showing one of the many informal roads through the parcel)

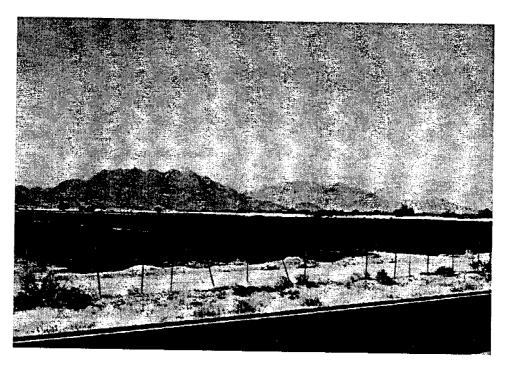


Figure 5. Overview of Developed Agricultural Fields Within the Project Area (view to the northwest from Old Highway 80)

support a more diverse plant community including blue paloverde, ironwood, burro brush, canyon ragweed, and non-indigenous tamarisk.

Wildlife is not abundant within the project area. Jackrabbits, cottontails and some raptors were the only animals sighted during the survey. However, biological analysis conducted for the proposed power plant indicates that more than 40 species of mammals, primarily small burrowing rodents and bats, could occur in the area. Larger mammals such as deer, coyotes, and javelina may be present but are uncommon. More than 100 species of birds and about 40 species of reptiles and amphibians also could be occur in the region.

### **CULTURAL HISTORY BACKGROUND**

### **Pre-Columbian Occupations**

Human societies have lived in Arizona for approximately 12,000 years and perhaps longer. For approximately 10,000 years these groups lived by hunting game and collecting native plant foods, and populations remained small and dispersed. The earliest cultural group to have occupied southwest Arizona is known as the Malpais, and some researchers conclude this culture dates earlier than 10,000 BC (Hayden 1966). Characteristic traits of the Malpais include unifacially flaked stone chopper-scrapers, several forms of shell implements, sleeping circles, trails, shrines, and intaglios. Malpais artifacts often are heavily coated with desert varnish and found on desert pavements. More recent evaluations have concluded that these traits are not exclusive diagnostics of the Malapais and also are associated with later Archaic and Formative cultures of the region (McGuire and Schiffer 1982).

San Dieguito, a Paleo-Indian complex, follows Malpais in the regional cultural history sequence (Rogers 1929). Stone tools of the early San Dieguito I phase bear a resemblance to those of the Malpais tradition and have been interpreted as roughly contemporaneous with the Paleo-Indian Clovis culture identified by distinctively fluted points used to tip spears or darts (Rogers 1929; Warren 1967). Evidence of the Paleo-Indian tradition in the region is scarce. In their overview of southern Arizona, Whittlesey and others (1994) identify only a single Paleo-Indian projectile point recovered along the Gila River in the Painted Rocks Reservoir area, and characterize it as a reworked Folsom point. This type of point dates to approximately 8,000 to 9,000 BC, somewhat later than the Clovis culture.

The extinction of large Pleistocene mammals was at least one cause of a shift from a largely hunting economy characteristic of the Paleo-Indian period to the Archaic lifeway, which revolved around the hunting of smaller game and collection of a broad spectrum of wild plant foods. The Archaic period in southwestern Arizona may have begun around 7,500 BC, and extended to AD 200. Sites dating to this period include camp clearings, zoomorphic intaglios, trails, and shrines. Archaic era assemblages of flaked and ground stone artifacts in southern Arizona are referred to as the Amargosa and Cochise complexes. The phases within these complexes are distinguished on the basis of changes in the styles of points used to tip spears and darts and the increasing frequency of ground stone artifacts.

Archaeological surveys undertaken prior to construction of the Palo Verde Nuclear Generating Station, Central Arizona Project aqueduct, and Harquahala Irrigation District canals resulted in the discovery of Archaic period sites to the north of the project area. Diagnostic late Archaic projectile points, including San Pedro, Amargosa, and Elko corner-notched styles, were found along Centennial Wash in the Harquahala Valley some 40 miles northwest of the proposed Panda Gila River Project (Bostwick 1988; Stone 1986). Excavation at some of these sites revealed that they were shallow and the majority of artifacts and features were visible on the surface of the ground. Nevertheless, these sites demonstrate that hunter-gatherers exploited the seasonal plant and animal resources of the deserts of west-central Arizona for thousands of years.

About two to three thousand years ago subsistence strategies shifted to farming crops of corn, beans, squash, and cotton. Regional populations grew larger, settlements became more permanent, and ceramics were produced. The aboriginal farmers of this era in central Arizona are known as the Hohokam, and they became the most sophisticated irrigation agriculturists in North America. Hohokam villages along the Gila River extended west as far as the Gila Bend area. Some of the Hohokam villages along the Gila River were quite large, and had public architectural features such as ballcourts and platform mounds.

Other farming societies along the lower Colorado River Valley are known as the Patayan culture, but also have been referred to as Yuman or Hakatayan (McGuire and Schiffer 1982). The Patayan have been studied much less than the Hohokam, but appear to have practiced only floodwater farming and never built canal systems like the Hohokam. Rogers (1945) believed the Patayan culture arrived in southwestern Arizona as a result of immigration from southern California. The Patayan occupation has been divided into three phases, beginning about AD 850 and continuing to about 1850 (Roberts and others 1993). Over much of southwestern Arizona Patayan sites appear to be ephemeral, indicating the remains of camps or limited activity loci, however larger sites, particularly along the Gila River, represent more permanent villages (McGuire and Schiffer 1982).

Investigations prior to the construction of Painted Rocks Dam northwest of Gila Bend documented a mixture of Hohokam and Patayan sites (Wasley and Johnson 1965). The distribution of Patayan pottery appears to have expanded to the east toward the Hohokam heartland during later periods of the Hohokam sequence. The many petroglyphs (aboriginal images pecked onto rock surfaces) in the Gila Bend region are the source of the name for Painted Rocks Dam and the nearby Painted Rock Park.

### **Ethnohistoric Occupation**

When Europeans first arrived in the area, they encountered numerous aboriginal groups. Yavapais inhabited west-central Arizona north of the Gila and Salt rivers. Various O'odham groups ranged primarily south of the Gila River. Groups that came to be known as the Maricopa lived along the lower Gila and Colorado river valleys and migrated upriver to join the Akimel O'odham (Pima) during the nineteenth century.

### Yavapais

During the ethnohistoric era, the Yavapais occupied a large, approximately triangular territory stretching from near Flagstaff in the north, southeast to the Globe vicinity, and west to near Yuma. The lower Gila River was the approximate southern boundary of traditional Yavapai territory. The Yavapais speak a Yuman language of the Hokan language family, which is related to the languages of numerous other groups living along the lower Colorado River Valley, as well as the upland dwelling Hualapai who lived north of the Yavapai.

The Yavapai population in the 1860s was estimated to be about 1,500 to 2,000, but tribal oral history indicates these numbers were greatly reduced from pre-contact levels by warfare and disease. Nevertheless, even earlier population densities were probably low, as is typical of hunting and gathering societies. However, the Yavapais also farmed at favorable locations, particularly in more upland areas where streams or springs provided sufficient water. Tribal oral history indicates the Yavapais pursued horticultural activity more intensively than is generally attributed to them by ethnohistoric accounts. After planting their gardens, the Yavapais would leave to gather and hunt, returning to harvest the crops that had matured.

The Yavapais followed a seasonal round, moving from lowland deserts to upland chaparral and woodlands to hunt and collect wild plant resources and tend their fields. They were organized into local groups or "camps" of up to 10 related households that were organized into bands. The bands were organized into three or four subtribes. The southwestern subtribe, the Tolkapaya, was the closest Yavapai group to the project area. The Tolkapaya periodically traveled to the Colorado River to plant crops, and during the 1850s and 1860s, some families joined the Cocopah after Euro-Americans started to invade their territory (Khera and Mariella 1983:41).

During the 1800s, Yavapais were hostile to O'odham groups living south of the Gila River, and the Hualapais living north of the Bill Williams River. The Yavapais also were, on occasion, hostile towards the Tonto Apaches to the east and incidents of "wife-stealing" were reported. However, relations with Apaches were generally cooperative, as they were with the lower Colorado River Valley Mohaves and Quechans with whom the Yavapais traded frequently.

Hostilities between Yavapais and Euro-Americans originated with the discovery of gold in the Prescott highlands in the 1860s. Some Yavapais were persuaded to move to the Colorado River Indian Reservation, but conflict intensified in the late 1860s. By 1871, the U.S. Army confined about 1,000 Yavapais to the military reservation at Camp Date Creek (Boles 1994). By 1873 the Yavapais were militarily defeated, with perhaps a loss of 15 to 30 percent of the tribal population. The surviving Yavapais were concentrated at Camp Verde, and in 1874 they were marched to the San Carlos Reservation, where they lived with Apaches for about 25 years. A few hundred Yavapais apparently escaped this incarceration and worked as laborers in the mines in the Castle Dome Mountains (Bean and Vane 1978:5-70).

By 1900, many Yavapais had moved back to their old homeland along the Verde River, and only about 200 Yavapais remained at San Carlos. The Fort McDowell Reservation was established on the lower Verde River in 1903. In that same year, a band of "Palomas Apaches" was reported living west of Gila Bend (James 1903), but these probably were Yavapais. A small, 40-acre

parcel also was set aside for the Yavapais near Camp Verde in 1910, and through small expansions in 1914, 1916, and in the 1950s, the parcel now totals 635 acres. Another small, 75-acre reservation was established near Prescott in 1935, and enlarged by 1,320 acres in 1956.

Today, there are approximately 800 enrolled members on the 38.6-square-mile Fort McDowell Reservation. About 1,180 enrolled members live on the Camp Verde Reservation parcels that aggregate to only slightly more than 1 square mile, and about 130 enrolled members reside on the 2.2-square-mile Yavapai-Prescott Reservation (Schell 1993).

# Maricopas

When Europeans first arrived in the area, the Maricopas resided in the Gila River valley east of Gila Bend and used adjacent uplands (Stein 1981). They spoke a Yuman language related to the Yavapai language. Spier (1933) conducted the basic ethnographic research of the Maricopas, and subsequent research was undertaken for the Indian Claims Commission (Fontana 1958; Hackenberg and Fontana 1974). Other researchers have investigated the confusing origin of the Maricopas (Bean and Vane 1978; Dobyns and others 1963; Ezell 1963; Harwell 1979; Harwell and Kelly 1983; Kelly 1972).

Spanish accounts are limited and not entirely consistent, but the Spanish named about 10 separate Yuman speaking groups living along the lower Colorado River and lower Gila River. Two groups formed a powerful north-south alliance—the Quechans (also called Yumas) residing near the confluence of the Gila and Colorado rivers and the Mojave who lived farther upstream along the Colorado River.

Numerous other, and apparently smaller, groups were part of a more general east-west alliance. Starting at the Colorado River delta, these groups included the Cocopahs, Halyikwamis, and the Kohuanas, all living south of the Quechans, and the Halchidomas situated between the Quechans and Mojaves. Allies along the lower Gila River included the Kaveltcadoms, and farther upriver the Cocomaricopas and the Opas. Some researchers have concluded that Halchidoma, Kaveltcadom, Cocomaricopa, and Opa were simply geographical units of a single cultural group, which they refer to as the Panya (Bean and Vane 1978).

The population of the Panya probably was on the order of about 5,000 in the 1700s. The Panya lived in dispersed settlements (*rancherias*), similar to other Yuman speaking groups along the lower Colorado River. They hunted and exploited wild plant foods, but also fished and farmed with floodwater techniques.

The name "Cocomaricopa" may be the Spanish transliteration of the Pima (Akimel O'odham) name for a group that lived near modern day Gila Bend—Kokomalik Aapap. Aapap means "friendly enemies," a seeming oxymoron that made sense to the Pimas who lived to the east along the Gila River above the Salt River confluence and were enemies of the two strongest Yuman groups—the Quechans and Mojaves living along the lower Colorado River. Kokomalik refers to the Gila Bend Mountains. So, "Maricopa" may be derived from Spanish observers shortening the Pima's name for the "friendly enemies of the Gila Bend Mountain area."

Alternatively, some researchers have suggested that Maricopa evolved from the Spanish word "mariposa," or butterfly, which might have been used to describe the brightly painted Indians.

Whatever its origin, Maricopa came to be first applied in about 1839 to an amalgam of the various remnants of the Panya who had absorbed the Kohuana and Halyikwamai by that time. The groups of Panya had been driven from the lower Colorado and lower Gila river valleys by increased pressure from the Mojaves and Quechans, perhaps stimulated by the arrival of mountain men in search of furs or new markets for slaves in Mexico. The fleeing Panya took up residence in south-central Arizona adjacent to the Pimas on the Gila River above its confluence with the Salt River and became known collectively as the Maricopa. Some Halchidoma first fled to Sonora and resided there for several years before returning to the Gila Valley to join their relatives. The Maricopas adopted aspects of Hispanic culture, including cattle, horses, mules, wheat, and possibly barley. Some Maricopas spoke Spanish well, serving as interpreters for the Pimas (Harwell and Kelly 1983:75).

In the 1840s, military battalions traveling to California passed through the Pima and Maricopa villages, purchasing food from them. After the discovery of gold in California, about 60,000 "Forty-niners" crossed Arizona along this trail, creating a huge market for the Gila River farmers, who raised and sold three crops of wheat during the summer of 1849. In the 1850s, travelers on stage lines, including the Butterfield Stage, also took advantage of the "roadside groceries" offered by the Pima and Maricopa Indians.

The Pimas and Maricopas never fought the Americans, and in 1859 the federal government rewarded them by setting aside the first reservation in Arizona for their use. The Pimas and Maricopas, in fact, joined the U.S. Army troops in fighting their common enemies, the Apaches and Yavapais. Despite putting their lives on the line, the Pimas and Maricopas were ill-rewarded. American farmers settled on the Gila River in the Florence and Safford areas upstream of the Pimas and Maricopas, and began building their own irrigation canals. The Americans diverted so much of the river flows that by 1871 the Pima and Maricopa fields were left dry. The natives refer to the subsequent half century as the "years of famine." Some Pimas and Maricopas moved north to the Salt River, where a reservation was established in 1879, and others moved to the confluence of the Salt and Gila rivers (DeJong 1992).

Today, the Maricopas continue to reside primarily in two communities. There are approximately 5,400 enrolled tribal members at the 87-square-mile Salt River Reservation, of which approximately 100 are Maricopas (who identify themselves as Halchidhomas) concentrated in the Lehi area. There are approximately 11,600 enrolled tribal members on the 583-square-mile Gila River Reservation, of which about 600 are Maricopas, concentrated in the Laveen area in the northwestern corner of the reservation (Schell 1993).

# O'odham (Pimans)

The O'odham speak a Piman language of the Uto-Aztecan language family, which is quite distinct from the Yuman languages of the Hokan language family. The Hokan family includes Shoshonean languages such as Hopi and Paiute, as well as numerous languages extending far

south into Mexico. Fontana (1983a:125) concludes that no one knows exactly how long the Pimans have lived throughout what we know today as northern Sonora, Mexico and the western two-thirds of southern Arizona. However, there is general agreement that the extent of O'odham territory "from prehistoric times to the nineteenth century encompassed a vast tract extending from the Gulf of California across to the Salt River in central Arizona" (Hackenberg 1983:161).

O'odham ("we, the people") is the term used by all Upper Pimans to refer to themselves, but one the Spanish never used. The Spanish explorers referred to them as the Pima Altos (Upper Pimans), and recognized distinct groups based on geographical location and cultural differences, labeling them Papago, Pima, Sobaipuri, Soba, Gileños, and Piatos. Use of these labels was not entirely consistent, but desert-dwelling farmers south of the Gila River and west of the Santa Cruz River were generally called Papagos. The people dwelling along the middle Gila River were known as Pimas or Gileños. Groups living at Bac on the Santa Cruz River and along the San Pedro River were called Sobaipuris. People who lived in the extremely arid western and southwestern portions of the northern Sonoran Desert were known as the Sobas, and apostate Pimans who lived in the Altar Valley were called Paitos (Fontana 1983a:125).

The Pimeria Alta extends throughout portions of the Sonoran Desert where three modes of adaptation are recognized. Fontana (1983a:126-134) refers to these as No Villagers (*Hia-Ced O'odham* or Sand Papagos), Two Villagers (*Tohono O'odham* or Papagos), and One Villagers (*Akimel O'odham* or Pimas). Nabham and others (1989) question Fontana's characterizations of the Hia-Ced O'odham as "no villagers," pointing out that the Hia-Ced had substantial, repeatedly used camps at the better watered locations on the margins of their territory, such as the Gulf of California, the spring at Quitobaquito, and along the lower Gila River.

# Akimel O'odham (Pima)

Historically, the Akimel O'odham lived in permanent villages on the northern riverine perimeter of the Pimeria Alta. Although the Spaniards established settlements as far north as Tucson, they never settled among the Akimel O'odham. Numerous visits by various missionaries were made to the Gila River O'odham, most notably Father Eusebio Francisco Kino (Russell 1975:27-28).

After Mexico gained independence from Spain in 1821, more Mexican farmers, ranchers, and miners began moving north, and mission efforts decreased. These Mexicans moved into O'odham country and usurped their land and water holes. As the situation became more intolerable, the O'odham engaged the Mexicans in armed conflict. Fighting started in May 1840, and eventually escalated into a state of war that lasted until June 1843 when the O'odham capitulated (Fontana 1983b:139).

The raids of the Quechan from the west, Yavapai from the north, and Apache from the east probably were of more concern to the Gila River O'odham than the invasion of the Spaniards from the south. However, domesticated plants and animals brought by the Spaniards, especially winter wheat, markedly affected the Akimel O'odham economy (Ezell 1961, 1983:153; Russell 1975:90). The Gila River O'odham greatly expanded their farm production to meet market demands created by the Spaniards, and the resulting prosperity of the O'odham towns attracted

Apache raiders. At the end of the Hispanic era of hegemony in the mid 1800s, the Akimel O'odham were characterized as a "nation" that had become an economic force and virtually the only effective military force restraining the Apaches in Sonora (Ezell 1983: 155).

Today, the Akimel O'odham live on the Gila River (583 square miles), Salt River (87 square miles), and Ak-Chin (34 square miles) reservations in southern Arizona, and off-reservation in adjacent Casa Grande, Chandler, Coolidge, and the greater Phoenix metropolitan area. There are about 11,500 enrolled members at Gila River, 5,400 at Salt River, and 500 at Ak Chin (Schell 1993).

# Tohono O'odham (Papago)

The Tohono O'odham speak several dialects closely related to other Upper Piman languages. An early historical account of the Tohono O'odham was prepared by Lumholtz (1912), and more recent ethnohistories were prepared by Dobyns (1972) and Fontana (1981, 1983b). The Tohono O'odham have been the subject of considerable ethnographic research (for example, Underhill 1939, 1940, 1946).

Father Eusebio Kino was the first to document the Tohono O'odham as he pursued missionary work in Pimeria Alta from 1687 until his death in 1711. Although missions and associated visiting stations were established in southern Arizona, they were confined to the upper Santa Cruz and San Pedro river valleys. Although the Tohono O'odham were not directly affected by Spanish presence in their territory, some were enticed to move to the new mission communities.

The Gadsden Purchase of 1853-1854 split the Tohono O'odham territory, with the northern portion coming under control of the United States. The international boundary proved to be quite permeable for the Tohono O'odham for many decades, but eventually most of the Tohono O'odham migrated to the United States. The United States Senate had barely ratified the provisions for the Gadsden Purchase when Euro-American miners and mining promoters moved into the Papagueria, settling near Arivaca and Ajo. Mining activities quickly intensified contacts between Euro-Americans and the Tohono O'odham, first as the Euro-Americans rushed to the California goldfields and then as many came back to prospect in Arizona.

Historically, the Tohono O'odham lived in the eastern portion of the Papagueria where a biseasonal rainfall pattern enabled them to depend on a subsistence strategy that mixed farming with hunting game and gathering a diversity of desert plant foods. These native foods included saguaro fruit, mesquite seeds, and fruits of cholla and prickly pear cactus (Castetter and Underhill 1935). The Tohono O'odham followed a seasonal migration pattern in that they "had winter dwellings in the mountain foothills next to the permanent springs as well as summer dwellings in the intermontane plains where they farmed at the mouths of washes after the summer rains had watered their fields" (Fontana 1983a:131). The material culture, social organization, and subsistence practices of the Tohono O'odham have been relatively well studied (Bahr 1983; Castetter and Bell 1942; Fontana 1974, 1983a, 1983b; Fontana and others 1962; Russell 1975; Underhill 1939).

As Euro-American settlement increased, reservations were established for the Tohono O'odham. The San Xavier Reservation was set aside first in 1874. The construction of the transcontinental Southern Pacific Railroad through southwestern Arizona in the 1880s depended in large part on Tohono O'odham labor, and led to the establishment of both Tohono O'odham and Euro-American settlements at Gila Bend (Hackenberg 1946). Another small reservation encompassing about 16 square miles was established at Gila Bend in 1882, and about 300 people were living there in three villages after the turn of the century (Fontana 1983b; Lumholtz 1912). Congress appropriated funds in 1914 to build a day school on the reservation at Gila Bend. The main Tohono O'odham reservation was not established until 1916.

The Tohono O'odham group that occupied the area along the Gila River in the vicinity of Gila Bend was the Huhu'ula. In May 1774 Captain Juan Bautista de Anza apparently encountered a group of Huhu'ula along the Gila River where they lived and farmed seasonally (Bean and Vane 1978:5-59). Farther west, the Hia-Ced O'odham came to the Gila River seasonally to exploit riverine resources. The Huhu'ula and Hia-Ced O'odham ranged primarily south of the Gila River but hunted and gathered wild foods to the north, probably as far as the Eagletail and Kofa mountains.

Today, there are approximately 17,400 enrolled tribal members on the approximately 4,450 square miles of the Tohono O'odham reservations (Schell 1993). These include the main reservation along with San Xavier just southwest of Tucson and San Lucy at Gila Bend, both of which are governed as districts of the Tohono O'odham Nation. Some Tohono O'odham live on the Ak-Chin Reservation, and others live in nearby non-reservation communities of south-central Arizona and northern Sonora.

# Hia-Ced O'odham (Sand Papagos)

Rankin (1995:65-66) summarizes the scant available information concerning the Hia-Ced O'odham. She indicates that the group consisted of one or two bands that ranged widely in an area extending west from the Growler Mountains to the Colorado River, north to the Gila, and south to the Gulf of California. When Juan Mateo Manje accompanied the Jesuit priest Eusebio Francisco Kino through northwestern Sonora he gave the first written description of the Indians living there. He estimated there were about 500 of these Indians, who were called "Sobas" by the Spanish, and later came to be known as the "Sand Papagos." They wrested a living in the arid Western Papagueria by hunting wild game, collecting plants and insects, and gathering shellfish and other seafoods from the Gulf of California. They also traded salt gathered from salt deposits at the head of the Gulf of California and performed ceremonies in exchange for earthenware pottery from the Yuman-speaking Cocopahs who lived adjacent to them in the lower Colorado River delta (Fontana 1974:513, 1983a:127-128). According to Fontana (1974:516), the Hia-Ced O'odham obtained virtually all of their pottery in trade from the Yuman Indians and because they were nomadic, they cached much of their material culture where it was needed, leaving it to be used again during future visits. Their "houses" were made of crude stone corrals or stone sleeping circles. These consisted of rings of medium-sized rocks with cobbles stacked one to two courses high.

Hackenberg (1983:161) provides a brief overview of the occupation of this territory by one group of Hia-Ced O'odham.

The Sand Papago or Areneños intermittently occupied the forbidding Sierra Pinacate region of Sonora, west of the Ajo Mountains and south to the present international boundary (Childs 1954). This band, which probably never exceeded 150 members, had a deviant subsistence pattern consisting of fish, shellfish, and a few highly specialized plants of the region of which the most important was sandroot (*Ammobroma sonorae*). They ranged from the Gulf of California to the Tinaja Altas in Arizona and inhabited the driest part of the Sonoran Desert. Like all Pima peoples, their subsistence pattern was diversified, including mountain sheep and other game. They also planted at least one field at Suvuk in the Sierra Pinacate (Castetter and Bell 1942:63; Lumholtz 1912:239-331, 394-397).

Given the extreme desert environment in which the Hia-Ced O'odham lived, it is not surprising that water was of great concern. The rivers marking the boundaries of their territory—the Sonoyta, Gila and Colorado—were the most substantial sources of water. Other sources included fracture and fault springs, especially the ones at Quitobaquito and Quitovac and the head of the Gulf of California. Other ephemeral sources included streams, ponds, and charcos that briefly held water after rains, and *tinajas* or rock tanks that periodically fill with rain and flood water. There are about two dozen *tinajas* scattered throughout the Western Papagueria. Scatters of flaked stone and sherds of broken ceramic vessels, as well as other archaeological materials near all of them indicate "man's former campsites, all giving testimony to the man's dependence on these sources of water" (Fontana 1983a:129). Trails that run from water source to water source also are evidence of their importance to human existence in this part of the Sonoran Desert that was home to the Hia-Ced O'odham.

Until quite recently, it was thought the Hia-Ced O'odham of the Western Papagueria no longer existed as a cultural group (Bell and others 1980; Fontana 1974, 1983a; Hayden 1967). Indeed, during the last half of the nineteenth century many Hia-Ced died at the hands of Mexicans and Euro-Americans as well as succumbing to epidemic diseases. Survivors moved into mining camps and non-Indian settlements in southern Arizona, and others moved onto the Papago Indian Reservation and intermarried or enrolled with the Tohono O'odham. Today, approximately 1,300 descendants of these survivors are reclaiming their identity. Two efforts—one by the Hia-Ced Program supported by the Tohono O'odham Nation and one by the Hia-Ced Alliance promoted by off-reservation Hia-Ced—are seeking federal recognition and establishment of a reservation (Annerino 1994; Nabhan and others 1989:509).

# **Euro-Americans**

The history of the region has been characterized as long, but having a very short period of intensive settlement and development (Western Interpretive Services 1975). The first Euro-Americans visited the Gila Bend area in 1699, and Spain claimed hegemony in the region for more than another century until 1821 when Mexico won independence. Prospectors associated with the missions reportedly discovered hematite and other mineral deposits at Ajo as early as

1750 (Whittlesey and others 1994), and the Juan Bautista de Anza expedition passed through the area in 1774. However, the Spanish did little more than occasionally travel through the area. The Spanish established two small missions in the Yuma area in 1781, but the local Quechan revolted the following year and drove the Spanish out.

The somewhat more than three decades of the Mexican era saw virtually no changes. However, at about this time a few English-speaking and French-speaking fur trappers contacted the Piman groups living along the Gila River, presaging future changes. The United States acquired the region through war with Mexico and the subsequent Gadsden Purchase of 1854. The pace of Euro-American settlement increased markedly.

In 1846, during the war with Mexico, American troops of the Mormon Battalion built a wagon road that followed the Gila River through southwestern Arizona to Yuma. A freighting and mail station was established on the Gila Ranch along this Gila Trail (or Southern Overland Trail), and became a major stop on the road between Tucson and Yuma (Walker and Bufkin 1986). This station became the focus of local settlement in the 1850s. By the 1860s American settlers excavated the first irrigation ditches and began farming in the Gila Bend area, and in 1880 the current town site was laid out when the Southern Pacific Railroad was constructed through the area (Granger 1983).

Soon after, an estimated 60,000 immigrants traveled down the Gila and Santa Cruz rivers, as well as the Camino del Diablo, to California during Gold Rush of 1849. Many were miners or mining promoters. The 1870s and 1880s brought increasing Euro-American occupation of southwestern Arizona. The construction of the Southern Pacific Railroad and later, in 1916, the construction of the Tucson, Cornelia, and Gila Bend Railroad (TC&GB) linked communities of Gila Bend and Ajo, stimulating further growth in mining activities and commerce.

Irrigation diversions were washed out frequently by the fluctuating flows of the Gila River. The completion of the concrete Gillespie Dam in 1921 provided a secure diversion, and promoted steady growth of agricultural development in the Gila Bend area, which also was also supplemented by pumped groundwater. Today, cotton farming continues to dominate the local economy.

#### RECORDS REVIEW

Records were reviewed at the following agencies and research institutions:

- SHPO
- ASM
- Museum of Northern Arizona (MNA)
- Pueblo Grande Museum
- Department of Anthropology at Arizona State University (ASU)
- State Office and Phoenix Field Office of the Bureau of Land Management (BLM)

The goal of this review was to identify any prior cultural resource surveys and recorded archaeological and historical sites within approximately 2 miles of the proposed project. The records search area was generously defined to allow flexibility in project planning. The defined search area encompasses approximately 29 square miles, and includes approximately the western two-thirds of Township 5 South, Range 4 West, and portions of the adjacent Township 4 South, Range 4 West; Township 6 South, Range 4 West; and Township 5 South, Range 5 West.

# **Prior Cultural Resource Studies**

The review of agency, museum, and university files documented 31 cultural resource studies that had been previously conducted in the vicinity of the project area (Table 1, Figure 6). [Note that different institutions and agencies have used their own designations in assigning project numbers and some projects are unnumbered. Where project numbers have been assigned by ASM these are used to identify surveyed areas on Figure 6, located in the end pocket of this report. Other agency numbers are used where no ASM numbers have been assigned, and where no project numbers have been assigned the surveys are identified by the cited references. Those surveys whose limits could not be identified are not depicted on Figure 6. Site numbers also have been defined by many institutions. Numbers assigned by ASM are used on Figure 6 whenever available. Note that the assigned numbers are within two grid units of the statewide numbering system—AZ T:14 and AZ Z:2. The final number of site designations are assigned serially within these grid units and it is these final digits that are used on Figure 6.]

	PRIC	TABLE OR CULTURAL RES		
	Project Name and Number	Scope	Sites	Reference
1	Survey of Western Arizona	extensive reconnaissance survey, inspected areas not well documented	approximately 15 sites recorded in Gila Bend vicinity, none can be identified as within project area	Gladwin and Gladwin 1930
2	Survey of Prehispanic Trash Mounds in Salt River Valley	testing project focused on archaeological sites in the Salt River Valley with only limited investigation in Gila Bend area	3 sites recorded in Gila Bend area; 1 site definitely in project area AZ T:14:1 (PG) [AZ T14:2 and 3 (ASM)] AZ Z:2:2 (PG) may be first recording of Gatlin Site	Schroeder 1940 (see Bostwick 1993)
3	Survey of Painted Rocks Reservoir	extensive reconnaissance of reservoir area (~70 to 75 mi <sup>2</sup> )	28 sites, 11 in project area AZ T:14:2-11 (ASM) AZ Z:2:1 (ASM)	Schroeder 1961 (also see Schroeder 1952)
4	Survey and Data Recovery within Painted Rocks Reservoir	extent of survey not documented, three winter seasons of excavations	26 additional sites recorded, 5 in project area AZ T:14:14, 15 (ASM) AZ Z:2:4, 5, 6 (ASM) 18 sites excavated, 7 in project area AZ T:14:6, 7, 10, 11, 14, and 15 (ASM) AZ Z:2:1 (ASM)	Berge 1968 Wasley 1960a Wasley and Johnson 1965

	PRIC	TABLE OR CULTURAL RES		
	Project Name and Number	Scope	Sites	Reference
5	Summary of Sites in Maricopa County ASM 1964-4	vehicular and pedestrian survey of known site locations, , 4 areas visited in project vicinity	352 sites, 12 in project area AZ T:14:2-11, 14, 15 (ASM) AZ Z:2:1 (ASM)	Ayres 1965
6	ADOT Materials Pit #8176 ASM 1974-8	40 acres	1 previously recorded site, AZ Z:2:4 (ASM)	Masse 1975
7	Liberty to Gila Bend 230kV Transmission Line Surveys	1,630 acres (200 feet by 9 miles) (50-150 feet by 45 miles) (240 feet by 25.5 miles)	18 sites, 1 in project area, AZ 2:2 (MNA) [NA 14,624]	Stein 1977 Western Interpretive Services 1975
8	Painted Rock Reservoir Survey ASM 1979-42	4,000 acres (10% environmentally stratified sample)	30 sites, 5 in project area (2 previously recorded), AZ T:14:8, 10, 32 (ASM), AZ Z:2: 12-13 (ASM)	Teague and Baldwin 1978
9	B.C. Williams ASLD Lease Application # 03-78099 ASM 1980-46	~ 15 acres	none	Madsen 1980
10	ADOT Materials Pit #8607 ASM 1980-188	80 acres	none	Fink and Sires 1980
11	APS/SDG&E Transmission Line Alternatives Survey BLM 12-60	138 acres (660 feet by 1.7 miles)	none	Wirth Associates 1980
12	ASLD application #01-81186 ASM 1981-081	1,440 acres	none	Lange 1981
13	Mr. A.E. Sandorf ASLD Agricultural Lease ASM 1981-86	640 acres	none	Urban 1980
14	BLM State Selection #A- 15986-2	1.4-mile-long transect	1 site AZ Z:2:1 (BLM)	Simonis 1981
15	ADOT Materials Pit #8644 ASM 1982-199	320 acres	none	Tagg 1980
16	ADOT Materials Pit 1511 ASM 1983-102	67 acres	none	Perrine 1981
17	Papago-HUD House Lot Survey ASM1985-162	27 acres	3 sites, none in project area	Seymour and Maldonado 1981
18	Painted Rock Site Inventory, Phase I ASM 1987-257	recording and evaluation, survey limited to relocating known sites	28 previously recorded sites and 6 newly discovered, 5 previously recorded in project area, AZ T:14:8, 10, 32 (ASM) AZ Z:2:12-13 (ASM)	Bergin and Bruder 1988
19	Painted Rock Petroglyph Project, Phase 2 ASM 1987-257	180 acres	54 sites, 20 in project area (5 previously recorded), AZ T:14:8-11, 32-38, 46- 49, 53-57 (ASM)	Wallace 1989
20	Gila Bend-Mobile 69kV transmission line ASM1988-228, BLM 12-108	68 acres (30 feet by 18.7 miles)	3 sites, none in project area	Hoffman and Effland 1988
21	Hassayampa-Gila Bend Telephone Cable ASM 1989-22	41 acres (50 feet x 6.7 miles)	none	Macnider 1989
22	Gila Bend Airport Extension Survey SHPO 2990-I, 3707-R	15 acres	none	Macnider 1990

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	PRIC	R CULTURAL RE	SOURCE STUDIES	
	Project Name and Number	Scope	Sites	Reference
23	Business Route 8 Right-of-way Survey ASM 1991-243	67 acres (150-400 feet by 2.4 miles)	1 site AZ Z:2:32 (ASM)	Hathaway 1991
24	Recontec Hazardous Waste Management Facility Survey SHPO 3054-I, 3911-R	45 acres	1 site, AZ Z:2:31 (ASM)	Doyel 1991
25	Gila Bend Airport Expansion Survey ASM 1993-49	12 acres	none	Adams 1993
26	Gatlin Site Park Survey	110 acres	1 previously recorded site, AZ Z:2:1 (ASM)	Doyel 1993
27	EPNG Pacificorp Turbine Pipeline Project ASM 1994-157	441 acres (200 feet by 18.2 miles)	1 site, none in project area	Rogge 1994 Rogge and Shepard 1994
28	Survey of State Route 85 Right-of-Way, Gila Bend to Buckeye ASM 1994-330	2,643 acres (200-2,000 feet by 40 miles)	66 sites, 22 in project area (1 previously recorded), AZ T:14:28, 61-64 (ASM) AZ Z:2:39-55 (ASM)	Harmon and Beyer 1995
29	Tohono O'odham Housing Survey ASM 1994-427	150 acres	none in project area	Lascaux and Anton 1993
30	Gila Bend Main Street Survey ASM 1997-456	43 acres	none	Aguila 1997
31	ADOT Yuma I Survey ASM 1998-245	59 acres	none	Larkin and Giacobbe 1998

Many of these surveys were associated with the construction and operation by the U.S. Army Corps of Engineers of the Painted Rocks Dam. However, systematic archaeological survey in the region began much earlier when Gladwin and Gladwin (1930) worked to map the western range of the "Red-on-buff Culture" that is known today as the Hohokam. They located approximately 15 archaeological sites in the Gila Bend vicinity. Almost all of these were identified as Colonial and Sedentary period Hohokam sites along the big bend of the Gila River, which was essentially the westernmost Hohokam sites they identified. The Gladwins also noted the interface of Hohokam and Yuman (Patayan) sites in the vicinity of Gila Bend, but suspected the two cultures were not contemporaneous. They recorded Patayan (Yuman) sites primarily west of Gila Bend, but they also mapped a cluster near the confluence with the Hassayampa River. The Gladwins' survey documentation is not sufficiently precise to identify any of the sites they recorded as being within the Panda Gila River Project area.

About a decade later, Schroeder (1940) recorded a site that he first designated simply as No. 73 as part of his stratigraphic survey of pre-Spanish mounds of the Salt River Valley. The site was also registered as AZ T:14:1 (PG), and Schroeder subsequently designated this site as two separate sites, AZ T:14:2:2 and 3 (ASM). They are approximately 3 miles north of the Panda Gila River Project area. Schroeder also recorded site AZ Z:2:1 (GP) (or No. 69) to the west of the project area, and site AZ Z:2:2 (GP) in Section 17, T5S, R4W and this may have been the first recording of what later came to be known as the Gatlin Site.

Another decade later Schroeder (1952) briefly visited the area in conjunction with a survey of the lower Colorado River Valley and the lower Gila River Valley. Several years later in December 1957, he returned with Paul Ezell to conduct approximately a week of survey within the reservoir for the then proposed Painted Rocks Dam. The reservoir behind this flood control dam could extend some 28 miles upstream and inundate approximately 70 to 75 square miles during major floods. The specific areas that Schroeder and Ezell surveyed within the reservoir area are not documented, but they found and recorded 28 Hohokam, Patayan, and historical sites (Schroeder 1961). Eleven of these sites are within or partially within records search boundary area. These sites include the Gatlin Site, a large Hohokam village with two ballcourts and a platform mound, and the historical Gila Bend Station along the Butterfield Trail and within the corridor that was subsequently designated as the Juan Bautista de Anza National Historic Trail.

To mitigate the impacts of the dam, Wasley and Johnson (1965) conducted supplemental survey recording an additional 26 archaeological sites. The areas surveyed and the survey methods of Wasley and Johnson are poorly documented, but five of the sites they recorded are within the records search area. Wasley and Johnson (1965) selected 18 sites from the expanded site inventory for further investigations and excavations that were conducted between 1958 and 1961. Seven of these sites are within the record search area. As a result of these investigations the Gatlin Site was designated as a National Historic Landmark in 1964 (see Weiss 1975).

In 1964, another major excavation was conducted at the Fortified Hill Site or Fortaleza (AZ T:13:8 [ASM]) on the north side of the reservoir (Greenleaf 1975). This early Classic village with rock-walled rooms may have been occupied year round from about AD 1200-1275. This site is defensively located on a hill top some 3 to 4 miles to the northwest of the proposed plant site for the Panda Gila River Project.

In the 1960s, a study was conducted to summarize information about archaeological sites throughout Maricopa County. Information about 352 sites was compiled on the basis of file information and limited field inspections. Four areas within the records search area were visited. Apparently, 13 archaeological sites previously recorded within the records search area were inspected, but no substantial new information was collected (Ayres 1965).

In 1964, an additional archaeological survey was conducted along the Gila River for flood control studies downstream of the Painted Rocks Dam west almost to Yuma. A total of 85 prehistoric and historic sites were located and recorded but these are all well to the west of the project area (Vivian 1965).

Because of anticipated changes in the reservoir release schedule, the Corps of Engineers initiated additional investigations in the vicinity of the Painted Rocks Reservoir in the 1970s. Phase I of these investigations involved a pilot study of the entire reservoir area for planning purposes (Teague and Baldwin 1978). This project consisted of an intensive pedestrian survey of 100 40-acre units, making up a 10 percent sample of each of four distinct environmental zones. This survey located 28 prehistoric and two historic sites, mostly on the terraces adjacent to the Gila River. Five of these sites (two of which were previously recorded) are within the records search area.

In 1978 and 1979 subsequent test excavations were carried out by the Arizona State Museum (ASM) at three sites (two Hohokam villages and a cluster of rock circles), all located well to the west of the Panda Gila River Project area (Teague 1981). One of these sites was within a borrow area used for construction and maintenance of Painted Rocks Dam, and the other two sites were within areas about to be developed for agriculture. The Corps of Engineers funded the work at the site within the borrow area and provided limited funding to support the limited excavations by ASM at the other two sites.

Due to recurring episodes of high water levels in the reservoir during the 1970s, the Corps of Engineers sponsored two studies within a 640-acre parcel to evaluate the effects of inundation on archaeological sites (Bruder and Spain 1986; Phillips and Rozen 1982). Not surprisingly, investigations of 10 archaeological sites within this parcel demonstrated how adversely archaeological sites are affected by inundations, especially those located on non-level surfaces. This study was to the west of the project area.

During the 1980s, follow-up studies to the Phase 1 survey and inventory initiated by Teague and Baldwin (1978) were conducted (Bergin and Bruder 1988). The objective of the project was to relocate and record the previously discovered 30 archaeological sites and prepare recommendations for their management. Sixteen of the original 30 sites were relocated, 12 others were found to be badly disturbed or destroyed by flooding, and logistical difficulties prevented visits to two sites. Six additional sites were recorded. Five of the reinspected sites originally recorded by Teague and Baldwin are within the records search area.

In 1987 the Corps of Engineers sponsored additional investigations of petroglyph sites in the Painted Rocks Reservoir to mitigate adverse effects of reservoir inundation (Wallace 1989). Phases 1 and 2 of this survey and recording project documented 54 sites. Twenty of these sites (five of which had been previously recorded) are within the records search area. Based on an analysis of the motifs, Wallace concluded that the petroglyphs generally are of a Hohokam style and different than petroglyphs typical of the Lower Colorado River Valley.

In 1989, the Corps of Engineers completed a historic properties management plan for the Painted Rocks Reservoir (Dart and others 1989). Information about some 200 archaeological and historical sites within the reservoir management area and adjacent areas was compiled.

Three studies have been conducted in support of planning the development of the Gatlin Site Cultural Park as a heritage tourism attraction. These include a research design for ongoing excavations envisioned as part of the park development (Weaver 1984), and a master development plan for an interpretive park (Hohmann 1989). Most recently, an interpretive and stabilization plan was prepared in conjunction with an intensive survey of the 110 acres acquired by the Town of Gila Bend for the proposed park (Doyel 1993).

Four other survey projects identified within the records search area had been undertaken for Arizona Department of Transportation materials pits. Survey of more than 500 acres at these pits located only a single archaeological previously recorded by survey for the Painted Rocks Reservoir.

Four other surveys within or partially within the records search area had been conducted in support of street and highway projects near Gila Bend. These surveys encompassed more than 2,800 acres and resulted in the discovery of 67 archaeological and historical sites. Twenty-three of these sites are in the records search area.

Three surveys within or partially within the records search area had been conducted for applications to lease state trust lands. These surveys encompassed almost 2,100 acres, but resulted in the discovery of no archaeological or historical sites. Another sample survey in support of the transfer of a section of federal land to state trust land status resulted in the discovery of one site—a historical Chinese labor camp associated with construction of the Southern Pacific Railroad.

Three surveys within or partially within the records search area were conducted for transmission line projects. Although 21 archaeological sites were recorded within the more than 1,800 acres surveyed for these projects, only a single site is in the records search area. Other linear surveys for a telephone cable project and a pipeline encompassed more than 480 acres and resulted in the discovery of only a single site, but it is not in the records search area.

Two small surveys of house lots at the San Lucy District of the Tohono O'odham Nation found no archaeological or historical sites. Two surveys for expansion of the Gila Bend Municipal Airport encompassed about 27 acres, and found no archaeological or historical sites. Survey of 45 acres for a hazardous waste management facility found one historical archaeological site apparently related to a rodeo arena.

# **Previously Recorded Cultural Resources**

The cultural resource surveys conducted in the area recorded a total of 62 archaeological and historical sites within the records search area (Table 2, refer to Figure 6). More than 80 percent of these sites reflect aboriginal occupations, primarily by the Hohokam and Patayan with some possible Archaic era components. Ten of the sites appear to be remnants of aboriginal village sites, and ballcourts mark three of the sites as major centers of population. Another seven sites are artifact scatters that may represent other small villages, campsites, or temporary work locations, such as places where plant foods were cooked in pit hearths. Eleven of the sites have petroglyphs, which commonly are associated with other artifacts and sometimes with rock features. Nineteen of the sites have trails, and commonly these are associated with artifacts or features indicating an aboriginal origin.

Hohokam ceramics are reported on about 13 sites, and Patayan ceramics are reported on 5 sites. Both Hohokam and Patayan ceramics appear to be present on about 15 sites. Wallace (1989) identified a possible Archaic presence at two sites, AZ T:14:33 and 54 (ASM), on the basis of petroglyph styles.

A few of the sites have both aboriginal and historical Euro-American artifacts. Nine of the sites date from the historical era. Two of these might be Tohono O'odham settlements. Another is the Gila Bend stage station along the Butterfield Road, and the road itself also is recorded as a

TABLE 2 PREVIOUSLY RECORDED CULTURAL RESOURCES	Significance/Status	condition and register eligibility	unevaluated	condition and register eligibility unevaluated	egiste	l 🗓	regist		re-recorded	r eligibility	e-recorded to	e-recorded to		
			nue	condition an	condition and register eligibility unevaluated	condition and register eligibility unevaluated	tested, condition and register eligibility unevaluated	partially excavated	some flood damage, re-recorded to assess flood damage	condition and register eligibility unevaluated	partially excavated, re-recorded to assess flood damage	partially excavated, re-recorded to assess flood damage	partially excavated	partially excavated
	Description	Patayan (Yuman) and Classic period Hohokam artifacts eroding out of	Gila River terrace, probable village site	Fatayan (Yuman) cremations and ceramics eroding out of river terrace, probable village site	Patayan (Yuman) cremations, fire-cracked rock, shell and flaked stone artifacts, probable village site	aboriginal artifacts (shell, stone), and historical Euro-American artifacts, probable campsite	aboriginal ceramics and flaked stone, and possible cremation; historical iron, china, and glass artifacts, probable village site	historical stage station along Butterfield Overland Trail	aboriginal petroglyphs, bedrock metates and hammerstones	Patayan artifact scatter	large Classic period Hohokam habitation site with dense artifact scatter, possible trash mounds, 1 boulder alignment, cremations, and some Lower Colorado buff ware ceramics	Classic period Hohokam habitation site with trash mounds, cobble alignments, cremations, and artifact scatter	Colonial and Sedentary period Hohokam village with trash mounds, and 2 ballcourts	Colonial and Sedentary period Hohokam village with ballcourt
Site		AZ T:14:2 (ASM),	[AZ T:14:1 (PG)]	AZ 1:14:3 (ASM), [AZ T:14:1 (PG)]	AZ T:14:4 (ASM)	AZ T:14:5 (ASM)	AZ T:14:6 (ASM)	AZ T:14:7 (ASM), Gila Bend Stage Depot	AZ T:14:8 (ASM)	AZ T:14:9 (ASM)	AZ T:14:10 (ASM)	AZ T:14:11 (ASM) Bartley Site	AZ T:14:14 (ASM) Three Mile Site	AZ T:14:15 (ASM), Three Mile Site

		Reference	Wallace 1989	Wasley and Johnson 1965		Brown 1980	Harmon and Beyer 1995	Stein 1977	Bergin and Bruder 1988	Teague and Baldwin 1978 Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989		Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Wallace 1989	Hackbarth 1995	Harmon and Beyer 1995	National Park Service	1994	Harmon and Beyer 1995	Harmon and Bever 1995	Harmon and Beyer 1995
RESOURCES		Significance/Status	condition and register eligibility	unevaluated		recommended register eligible			recorded to assess reservoir impacts		recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts		recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	recorded to assess reservoir impacts	register eligible but segments have lost	historic integrity; general corridor	designated as Juan Bautista de Anza	National Historic Trail	recommended register eligible	potentially register eligible	potentially register eligible
TABLE 2 PREVIOUSLY RECORDED CULTURAL RESOURCES		Description	possible Classic period Hohokam petroglyph site			2 trails, flaked stone artifacts, Hohokam buff, red-on-buff, Santa Cruz	Red-on-buff, Gila Plain and possible Patayan Lower Colorado buff	ceramics	Hohokam and possibly Patayan artifact scatter with rock features and	possible buried structures	Hohokam and possibly Archaic and Patayan petroglyphs and flaked stone artifact scatter	Hohokam and possibly Patayan artifact scatter	Hohokam and possibly Patayan artifact scatter	Hohokam and possibly Patayan artifact scatter with 8 rock clusters or	possible roasiing pits	Hohokam and possibly Patayan artifact scatter and petroglyphs	Papago or Euro-American artifact scatter (wood, glass, hole-in-top cans, ceramics, small mano)	Hohokam petroglyphs, grinding slick, and possible trail	Hohokam petroglyphs and artifact scatter	Hohokam and historical Euro-American artifact scatter and petroglyphs	Hohokam petroglyphs and flaked cobbles	Patayan rock shelter and artifact scatter	Hohokam or Archaic petroglyph panel	Hohokam petroglyph panel	possible Hohokam petroglyphs	Hohokam and possibly Patayan petroglyph panels, rock clearing, possible trail, and flaked stone artifact scatter	historical road used by Butterfield Overland Mail Company from 1858-	1861, within corridor of Gila Trail followed by Juan Bautista de Anza in	1773-1776, later developed as wagon road by Mormon Battalion in 1846,	Timil folial data and Time 1 L C 1 L C 10 L	i uans, naked signe, and nonokam dun, reg-on-dun, and sail Red ceramics		4 trails, flaked stone, and Hohokam buff ceramics
	Site	Namber/Name	AZ 1:14:20 (ASM)	subsumed into	AZ T:14:33 (ASM)	AZ T:14:28 (ASM),	[AZ T:14:2 (MNA)]	NA 13,607	AZ T:14:32 (ASM)	Oale Site	AZ T:14:33 (ASM)	AZ T:14:34 (ASM)	AZ T:14:35 (ASM)	AZ T:14:36 (ASM)	A 7 T. 14.22 (ACM)	AZ 1:14:37 (ASM)	AZ 1:14:38 (ASM)	AZ T:14:46 (ASM)	AZ T:14:47 (ASM)	AZ T:14:48 (ASM)	AZ T:14:49 (ASM)	AZ T:14:53 (ASM)	AZ T:14:54 (ASM)	AZ 1:14:55 (ASM)	AZ 1:14:56 (ASM)	AZ T:14:57 (ASM)	AZ T:14:61 (ASM)	[AZ T:15:32 (ASM)]	[Butterfield Stage	A7 T-14-67 (ASA)	AC 1.14.02 (ASIM)	AZ T:14:63 (ASM)	AZ T:14:64 (ASM)
		:	2			14			2		16	17	18	6	5	3   7	71	22	23	24	53	97	27	27 2	2 2	30	31			;	35	33	34

		TABLE 2 PREVIOUSLY RECORDED CULTURAL RESOURCES	RESOURCES	
	Site Number/Name	Description	Significance/Status	Reference
35	AZ Z:2:1 (ASM) Gatlin Site possibly the same as AZ Z:2:2 (PG)	Colonial and Sedentary period Hohokam village with platform mound, 2 ball courts, 30 mounds, cremations, and pit house, small percentage of Patayan pottery	partially excavated, designated a National Historic Landmark, proposed for heritage tourism development	Ayres 1965 Doyel 1993 Hohmann 1989 Schroeder 1961 Wasley and Johnson 1965 Weaver 1984
36	AZ Z:2:1 (BLM)	Chinese railroad construction camp with 6 semi-subterranean structures, 18+ tent clearings, porcelain bowls, bottles, and cans, occupied circa 1875-1885	some artifacts collected, potentially register eligible	Simonis 1981
37	AZ Z:2:2 (MNA) NA 14,624	2 complete Yuman ceramic jars and 1 tin can, dates to about 1900	all items collected	Stein 1977
38	AZ Z:2:4 (ASM)	Hohokam, Tohono O'odham, and Euro-American artifact scatter, 2 vandalized cremations	sample of artifacts collected, condition and register eligibility unevaluated	Masse 1975 Wasley 1960b Wasley and Johnson 1965
39	AZ Z:2:5 (ASM)	Tohono O'odham ceramic scatter (Papago Red, Papago Black-on-red)	sample of artifacts collected, condition and register eligibility unevaluated	Wasley 1960b Wasley and Johnson 1965
40	AZ Z:2:6 (ASM) [South Allentown]	Sedentary period Hohokam village, 2 cremations excavated from site by avocational archaeologist	subsequently developed for farming, condition and register eligibility unevaluated	Wasley 1961
41	AZ Z:2:12 (ASM)	Hohokam, Patayan, and Tohono O'odham habitation site with 9 artifact concentrations	testing recommended to determine register eligibility	Bergin and Bruder 1988 Teague and Baldwin 1978
45	AZ Z:2:13 (ASM)	Hohokam, Patayan, and possibly historical Tohono O'odham habitation site with 2 artifact concentrations and cremations	testing recommended to determine register eligibility	Bergin and Bruder 1988 Teague and Raldwin 1978
43	AZ Z:2:31 (ASM)	concrete pad (possible dance floor associated with Frank (Pancho) Weidner's rodeo) and scattered cans, bottle caps, nails, and broken glass, used late 1940s-early 1950s	avoided by project, register eligibility unevaluated	Doyel 1991
4 2	AZ Z:2:32 (ASM) AZ Z:2:39 (ASM)	concrete building foundation, probably circa 1960 tourist cabin trail	not register eligible	Hathaway 1991
46	AZ Z:2:40 (ASM)	Southern Pacific Railroad, originally constructed in 1879	potentially register eligible, but segments have lost historic integrity as a result of ungrading	Harmon and Beyer 1995
47	AZ Z:2:41 (ASM) AZ Z:2:42 (ASM)	2 trails, 1 rock cluster (possibly fire-cracked), and 2 flaked stone pieces 3 trails, 1 possible rock cluster, 2 flaked stone pieces, and 1 piece of	potentially register eligible potentially register eligible	Harmon and Beyer 1995 Harmon and Beyer 1995
49	AZ Z:2:43 (ASM)	historical glass 1934 highway bridge	National Register listed	Fraser 1987
20	AZ Z:2:44 (ASM)	3 trails, 1 rock ring, flaked stone, Hohokam Gila Plain, Salt Red, buff, and Patayan Lower Colorado buff ceramics, and historical glass pieces	recommended register eligible	Harmon and Beyer 1995

		TABLE 2		
		PREVIOUSLY RECORDED CULTURAL RESOURCES	L RESOURCES	
	Site	THE TAX TO SERVICE THE TAX TO SE		
	Number/Name	Description	Significance/Status	Reference
51	AZ Z:2:45 (ASM)	3 trails, 5 or 6 roasting pits, flaked stone artifacts, 1 possible ground stone tool, Hohokam Gila Plain, red-on-buff, buff, and Patayan Lower Colorado	recommended register eligible	Harmon and Beyer 1995
		buff ceramics		
52	AZ Z:2:46 (ASM)	2 possible trails, 6 or 7 roasting pits, 1 rock alignment, and 1 cobble	recommended register eligible	Harmon and Beyer 1995
		CHUSIER		
53	AZ Z:2:47 (ASM)	5 trail segments, 2 rock features, flaked stone items, Hohokam Gila Plain and buff and mossibly Paravan Lower Colorado buff ceramics and 1	recommended register eligible	Harmon and Beyer 1995
		historical bottle neck		
54	AZ Z:2:48 (ASM)	15 trails, 5 rock features, flaked stone, and Hohokam Gila Plain and	recommended register eligible	Harmon and Beyer 1995
		possibly Patayan Lower Colorado buff ware ceramics		
55	AZ Z:2:49 (ASM)	2 trail segments, 2 cleared circles in desert pavement, flaked stone, and Hohokam Gila Plain ceramics	recommended register eligible	Harmon and Beyer 1995
26	AZ Z:2:50 (ASM)	2 trails 1 rock ring, and flaked stone artifacts	recommended register eligible	Harmon and Bever 1995
57	AZ Z:2:51 (ASM)	6 trails, 4 cobble clusters, Hohokam buff ware and Salt Red ceramics, and	recommended register eligible	Harmon and Beyer 1995
88	AZ Z:2:52 (ASM)	7 trails and 1 of flaked stone artifact	notentially register eligible	Hormon and Daylor 1005
89	AZ Z:2:53 (ASM)	4 trails, 1 Hohokam ceramic, 3 flaked stone artifacts	potentially register eligible	Harmon and Bever 1995
9	AZ Z:2:54 (ASM)	2 trails and quartz shatter of undetermined origin	potentially register eligible	Harmon and Bever 1995
19	AZ Z:2:55 (ASM)	2 trails and scatter of Hohokam ceramics (probably Gila Plain)	potentially register eligible	Harmon and Beyer 1995
62	Gila Bend Mountains		cultural associations for O'odham and	Bean and Vane 1978
		possibly burial and cremation	Yavapai	

historical site. The Butterfield Stage carried semi-monthly mail and passenger coach service between San Antonio and San Diego from 1858 until about 1880, when the Southern Pacific transcontinental railroad was built.

In 1990, Congress designated the route followed in 1775-1776 by Juan Bautista de Anza from Sonora, Mexico to San Francisco Bay as a National Historic Trail. This route followed aboriginal trails and parts of de Anza's travel corridor became known as the Gila Trail and subsequently were used for the Butterfield Road some 80 years. In contrast to the Butterfield Road, which can be specifically identified in places by wagon ruts, there is little physical evidence of de Anza's trek. Most of the de Anza Trail and associated campsites cannot be specifically identified. The best candidates for interpreting the de Anza Trail in the Gila Bend vicinity are Camps #27 and #28 in the Opas villages and Painted Rocks, all of which are west of the Panda Gila River Project area.

Other inventoried historical sites include the Southern Pacific Railroad and a Chinese labor camp apparently associated with the original construction of the line. Another historical property is a 1934 highway bridge that is listed on the National Register of Historic Places. Two other historical archaeology sites are more recent. One site apparently is remnants of a rodeo facility dating from the 1940s and another is the ruins of a tourist court that may date as late as the 1960s.

# Sites within Section 20, Township 5 South, Range 4 West

Only two of the previously recorded sites identified within the records search area are within or partially within Section 20, the proposed location of the Panda Gila River Project. Both of these sites are north of the footprint of the plant and switchyard.

The more substantial of these two sites is the Gatlin Site, a large Hohokam village designated as AZ Z:2:1 (ASM). The site, which is approximately 0.4 mile to the northwest of the proposed plant site, was partially excavated in 1958-1959 to mitigate the impacts of construction of Painted Rocks Dam. This site contained more than 30 trash mounds, two ballcourts, and one of the earliest platform mounds built within the Hohokam area. Excavation of the platform mound revealed that it had been modified and expanded several times, and eventually came to cover an area measuring about 75 feet by 95 feet and stood about 12 feet high. A crematorium and a large irrigation canal that headed some 5 miles upriver also were documented. Despite extensive testing, only two house floors were found. The site appears to have been occupied during the Santa Cruz, Sacaton, and Santan phases or perhaps for more than 400 years between about AD 750 to 1200. However, the most intense period of occupation could have been for a much shorter period of time.

Wasley (1960a:244), who led the excavations at the site, estimated that the site extended for about 1/2 mile in a northeast-southwest direction and was about 1/4 mile wide. Local residents claim the site was much larger, encompassing more than 3 square miles (Doyel 1993:5). These differences reflect, in part, the definition of what is part of the Gatlin Site. Wasley preferred to

think of the site as focusing only on the ceremonial precinct surrounding the platform mound, and others may have thought of outlying habitation areas as part of the site.

As a result of these investigations, the Gatlin Site was designated as a National Historic Landmark in 1964 and listed on the National Register of Historic Places in 1966. The limits of the National Historic Landmark were more or less arbitrarily defined to encompass the core of the site investigated by Wasley and Johnson (1965). The boundary was verbally described as a rectangular area measuring 2,250 feet north-south by 3,000 feet east-west. The site was described as encompassing 190 acres, although the described rectangle encompasses only about 150 acres. Doyel (1993) recommended deleting the eastern half of the landmark east of Stout Road, which includes the portion of the site in Section 20, because agricultural development had obscured all surface manifestations of the site. The National Park Service, the agency that designates National Historic Landmarks, has not acted on this recommendation.

The Town of Gila Bend has been planning a cultural park at the Gatlin Site for about 15 years, and has acquired 130 acres of the site just to the west and northwest of Section 20. However, heritage tourism facilities at the site remain unfunded and undeveloped.

Little is known about the second previously recorded archaeological site within Section 20. This site, designated AZ Z:2:6 (ASM), was recorded by Wasley in 1961. The site record describes the site as a "small group of scattered houses, 2 cremations dug out by Norton Allen" (a local avocational archaeologist). Wasley (1961) concluded that this site, along with sites AZ Z:2:4 and Z:2:5 (ASM) to the west of the Gatlin Site and other destroyed villages, were outlying habitation areas associated with the ceremonial center represented by the Gatlin Site. The plotted location of site AZ A:2:6 (ASM), which is approximately 800 to 900 north of the proposed plant site, subsequently was developed for agriculture, and today is irrigated alfalfa fields.

# **Survey Expectations**

The compiled information indicates that archaeological and historical sites are common in the vicinity of the project area. Numerous aboriginal village sites have been documented along the terraces of the Gila River, and such sites often contain subsurface features, including human burials. Other sites representing temporary camps or limited use areas are found in upland areas, and these are commonly limited to artifacts scattered on the ground surface or only shallowly buried. Other sites such as petroglyphs are common where suitable volcanic boulders are found.

Recent inventories that meet current standards for intensive survey are very limited within Section 20. No documentation was identified to specifically indicate that the proposed plant site had been previously surveyed for cultural resources, nor have any archaeological or historical sites been recorded at the plant site, although archaeological site AZ Z:2:6 (ASM) and the Gatlin Site National Historic Landmark are located to the north and northwest.

Most of the other recorded sites closest to the proposed plant site were found in upland settings along State Route 85. The density of sites along this highway corridor is relatively high, but most

of the sites are not particularly complex, consisting of scatters of artifacts on the ground surface, often in association with trails or rock features.

To gauge the potential for unrecorded historical Euro-American resources, historical maps of the project area were reviewed. In 1871, the General Land Office (GLO) first surveyed Township 5 South, Range 4 West, where the proposed plant site is located, and the adjacent townships to the north and west. The few cultural features depicted on the plats of these townships include the Gila Bend Station and the road between Tucson and Fort Yuma (the Butterfield Stage Route). A single house was mapped within these three townships. This house was about 4 miles to the west of the proposed plant site for the Panda Gila River Project and an irrigation ditch about 2.5 miles long had been built on the south side of the Gila River apparently to serve fields below the house. Another short irrigation ditch was mapped about 3.5 miles north of the proposed plant site, but no fields or houses are depicted at that location.

A road heading south from the only mapped house was identified as leading to the Arizona Copper Mine (near Ajo). The only cultural feature in the immediate vicinity of the proposed plant site was an unlabeled road that headed south from the Gila Bend Station and ran through the western portion of Section 20, continuing to the southwest to connect with the road to the Arizona Copper Mine

In sum, the records review indicated that no archaeological sites had been recorded within the proposed plant site, but one or more small sites might be expected in the undeveloped areas of Section 20. No major historical sites were anticipated.

#### FIELD SURVEY

# **Methods**

The survey crew identified the survey area using 7.5-minute U.S. Geological Survey (USGS) topographic quadrangles and an aerial photograph. The proposed plant site was relatively easy to locate because of the patterning of developed agricultural fields around the plant site and adjacent roads.

The six-person survey team surveyed the entire 255-acre parcel by walking observational transects at intervals of 50 feet (15 meters) or less. The survey area was relatively flat and easily traversed. Vegetation in the undeveloped areas was generally sparse, making it easy to inspect the ground surface for artifacts and features. The visibility of the ground within the agricultural fields, which are planted in alfalfa and hay, was poor. Berms for controlling irrigation water offered limited exposures within these fields. Most of the alfalfa stood only 3 to 6 inches tall and the surface of the ground was partially visible in these fields. The hay stubble, found in fields on the southwest corner of the survey parcel, virtually obscured the entire ground surface.

A GeoExplorer II global positioning system (GPS) unit was used to map the surveyed area, and isolated occurrences of cultural materials. This system has an accuracy of  $\pm 5$  meters or better with differential correction.

We used ASM guidelines in designating archaeological sites and defining their boundaries. ASM Administrative Rules (Chapter 8-201.A.3) implementing the Arizona Antiquities Act (ARS 41-841, et seq.), define an archaeological site as:

any area with material remains of past Indian or non-Indian life or activities that are of archaeological interest, including without limitation, historic or prehistoric ruins, burial grounds, and inscriptions made by human agency.

The ASM Site Recording Manual (version 1.1, page A-7) defines remains of archaeological interest as one or more archaeological features, which are, in turn, defined as:

Physical remains of past human activity which are at least 50 years old and which are distinguished by boundaries that are based entirely on observable variations in the spatial distribution of the remains. Features include passive accumulations of artifacts, such as artifact concentrations, as well as purposeful constructions, excavations, or deposits.

An artifact concentration is defined as "thirty or more artifacts within an area measuring no more than 50 feet (15 meters) in diameter, except in cases where the artifacts clearly originated from the same item."

Additional guidance is provided by an ASM letter dated 1 October 1994 that identifies other situations that may warrant designations as an archaeological site, including the following:

- 20 or more artifacts, including at least two classes of artifact types within an area 15 meters in diameter
- one or more archaeological features in temporal association with any number of artifacts
- two or more temporally associated archaeological features without artifacts

The ASM guidelines also recognize that other particular circumstances may warrant designation as an archaeological site, and encourage archaeologists to use professional judgment to make appropriate field decisions.

When cultural materials were located, the crew examined the surrounding areas to determine whether the finds warranted designation as a site or isolated occurrence. For this particular survey, much of the initial evaluations focused on determining whether isolated artifacts and small trash dumps were more or less than 50 years old. These determinations were based on examination of artifact manufacturing technologies and maker's marks. No artifact collections were made and no subsurface testing was undertaken during the survey.

#### **Survey Results**

The survey crew discovered numerous Euro-American artifacts scattered across much of the undeveloped land within the surveyed area. Some of these artifacts, particularly along Watermelon Road, represent roadside trash and are primarily beverage bottles and cans

undoubtedly discarded from passing vehicles. Other beverage containers are scattered about the undeveloped parcel, which is crossed with numerous informal roads. Much of the undeveloped parcel was found to have been previously disturbed by heavy equipment for reasons that are not obvious.

Other artifacts were found at about half a dozen informal trash dumps. Each of these dumps appears to represent approximately the equivalent of a 50-gallon drum or small pickup load of domestic trash. The source of this domestic trash is not obvious but very likely originated at residences in the general vicinity of the project area. The oldest dump, dominated by sanitary cans and broken milk bottles, is estimated to date from the 1950s. All the other dumps appear to be younger, as indicated by aluminum cans and aerosol cans. Because all the Euro-American artifacts appear to be less than 50 years old and none were identified as having exceptional historical values, they were not recorded as archaeological sites or isolated finds.

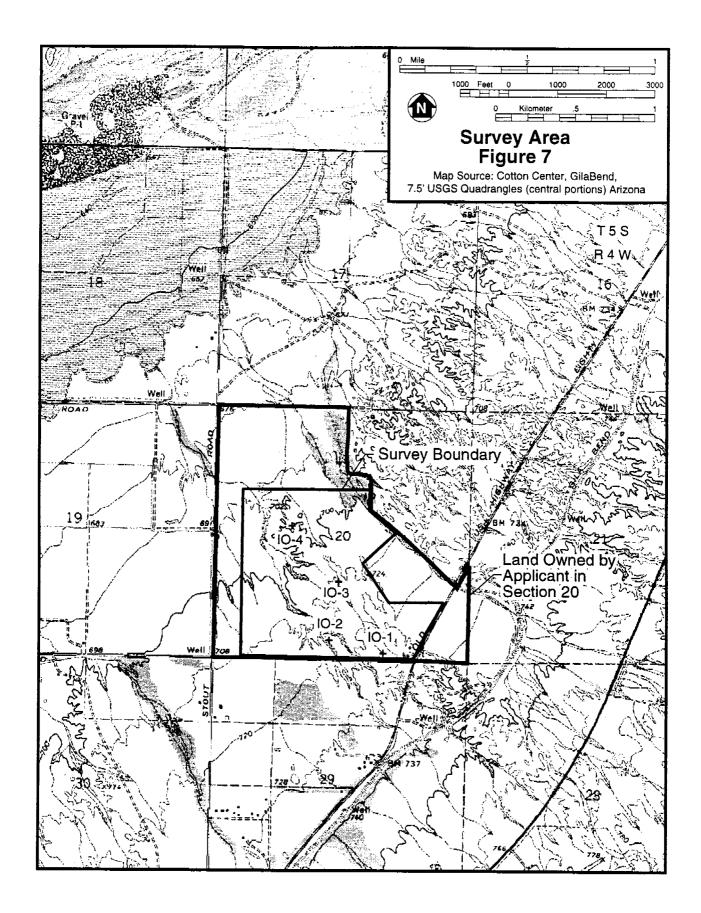
The crew found no archaeological sites but did discover four isolated occurrences (IOs) of archaeological materials (Figure 7, Table 3). From two to eight sherds of broken Hohokam ceramic vessels were found at these IOs.

Eight plain ware body sherds were found at IO-1, apparently representing fragments of two vessels. Three of these sherds are classified as Gila Plain, Gila Bend Variety, based on inclusions of black particles of temper and little mica (see Rodgers 1976:34; Wasley and Johnson 1965:12-13). The other five sherds are classified as Gila Bend, Salt Variety based on sand tempering and absence of the black particles and mica.

	TABLE 3 ISOLATED OCCURRENCES	
Number	Description	Dispersal Area (square meters)
1	3 Gila Plain, Gila Bend Variety body sherds, and 5 Gila Plain, Salt Variety body sherds	22.5
2	3 Gila Plain, Salt Variety body sherds	0.25
3	2 Gila Plain, Salt Variety body sherds	2.0
4	3 highly eroded red-on-buff sherds (type undetermined) and 1 basalt core tool	5.0

Three plain ware sherds were found at IO-2 and four at IO-3. All of these were classified as Gila Plain, Salt Variety.

Three highly eroded sherds were noted at IO-4. Traces of red paint on these sherds indicate they probably are Hohokam red-on-buff ceramics but the specific type could not be identified. A naturally smooth, hand-size cobble that had been unifacially flaked was found about 20 feet (6 meters) to the southeast of the sherds. The removal of three or four flakes from the end of this rock had created a sharpened edge, and step fracturing and edge damage indicated this minimally flaked rock had been used as an expedient chopping or scraping tool.



It is not obvious how the IOs came to be deposited at the locations where they were found, but they probably reflect limited use of upland areas adjacent to the farming villages that were located closer to the Gila River. Further study of these isolates is unlikely to yield important information, and we have identified no other values that would warrant their preservation. Therefore, we recommend that none of the recorded IOs be considered eligible for the Arizona Register of Historic Places or the National Register of Historic Places.

#### EFFECT ASSESSEMENT

The field survey found no evidence of significant archaeological or historical sites within areas that are likely to be directly disturbed by construction of the proposed power plant and switchyard for the Panda Gila River Project. The surveyed parcel overlaps the southern 200 to 300 feet of the plotted location of the previously recorded site AZ Z:2:6 (ASM), but the survey crew noted no indications of the site in the alfalfa fields that were developed after the site was recorded.

Little is known about this site, but it was described as a small Hohokam village site, probably related to the ceremonial precinct within the Gatlin Site. Sometimes agricultural development can completely destroy archaeological sites, but in other situations archaeological deposits and features may remain intact beneath the plow zone. Although the crew noted no artifactual evidence of the site, ground visibility was poor within the alfalfa fields that now cover this location. The levels of the various fields often are offset 3 to 6 feet (1 to 2 meters), indicating substantial amounts of soil were moved to level the land for farming and this may have destroyed or buried archaeological deposits. The former owner indicated that these fields were routinely tilled to a depth of 18 inches. Test excavations would be required to determine whether archaeological site AZ Z:2:6 (ASM) retains any subsurface integrity. However, the proposed plant site is about 800 to 900 feet south of the plotted location of site AZ Z:2:6 (ASM), and there is no indication that construction of the plant would disturb the site, if parts of it remain intact.

Portions of the evaporation pond and construction laydown areas were not intensively surveyed. However, these areas are within developed agricultural fields and no archaeological materials were noted within any of the fields that were intensively surveyed. No archaeological sites have been previously recorded in these areas, and we conclude that the potential for significant archaeological or historical resources being present within these unsurveyed areas is low.

Visual and noise effects on the planned Gatlin Site Cultural Park also were considered in conjunction with preparation of an application for a Certificate of Environmental Compatibility. A visual simulation from within the site at the corner of Stout Road and Indian Road, which is approximately 400 feet southeast of the platform mound, indicates the plant would be quite visible although it would be about two-thirds of a mile to the southeast. However, measures such appropriate coloring, vegetative screening, and construction of earthen berms could substantially mitigate the visual impacts.

The prevailing noise levels at the proposed plant site are typical of sparsely populated and agricultural areas in proximity to active highway, railway, and general aviation flight corridors.

Noise analyses indicate that at the corner of Stout Road and Indian Road ambient levels range from 24 to 53 A-wieighted decibels (dBA). The sources of these levels of noise included barking dogs, cows, coyotes, birds, trains, aircraft, insects, Highway 85 traffic, and farm equipment. Other locations within the Gatlin Site have ambient noise levels range from about 29 to 38 dBA, and sources include wind rustling, distant traffic, insects, and power line noise. Predicted contributions of noise from the proposed Panda Gila River Project at the Gatlin Site are 53 to 55 dBA. According to studies conducted by the Environmental Protection Agency, exposure to noise levels at or below 55 dBA will not produce significant speech interference either indoors or outdoors, and in typical communities will lead to negligible reaction, complaints, or annoyance.

#### CONCLUSION AND RECOMMENDATIONS

No significant archaeological or historical properties appear to be threatened by ground disturbing activities associated with the proposed development of the Panda Gila River Project. Although the proposed plant will conform to land use plans, potential visual and noise intrusions could occur within the setting of the proposed but not yet funded or developed Gatlin Site Cultural Park. Panda Gila River, L.P. is currently working with the Town of Gila Bend to develop measures to mitigate the potential visual and noise intrusions. These measures could include sensitive coloring of the plant and related facilities, vegetative screening, and perhaps construction of earthen berms to provide additional buffering.

If any human remains or funerary objects were to be unexpectedly discovered, they should be reported to the director of the ASM in accordance with Arizona Revised Statutes §§ 41-865. As more detailed plans are developed for the plant and related facilities, additional cultural resource inventory survey may be warranted.

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# UNITED STATES OF AMERICA BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

		)		
Panda Gila River, L.P.	)		Docket No. EG 00	000
		)		

# APPLICATION FOR DETERMINATION OF EXEMPT WHOLESALE GENERATOR STATUS

Pursuant to Section 32 of the Public Utility Holding Company Act of 1935, as amended ("PUHCA"), 15 U.S.C. §79z-5a, and Part 365 of the Commission's regulations, 18 C.F.R. Part 365, Panda Gila River, L.P., ("Panda Gila River" or the "Applicant") hereby applies for a determination that it is an exempt wholesale generator ("EWG").

# I. Name and Address of Applicant and Communications

The exact name, address and principal executive office of the Applicant are: Panda Gila River, L.P., 4100 Spring Valley Road, Suite 1001, Dallas, Texas 75244. All communications regarding this application should be directed to the following persons:

L. Stephen Rizzieri
Senior Vice President and General Counsel
Panda Energy International, Inc.
4100 Spring Valley Road, Ste. 1001
Dallas, TX 75244
Tel: (972) 980, 7159

Tel.: (972) 980-7159 Fax: (972) 980-6815

James K. Teringo, Jr.
Assistant General Counsel
Panda Energy International, Inc.
4100 Spring Valley Road, Ste 1001
Dallas, TX 75244

Tel.: (972) 980-7159 Fax: (972) 980-6815

# II. Information Required by the Commission's Regulations

In support of this application, Panda Gila River provides the following information in accordance with Section 32 of PUHCA and Section 365.3 of the Commission's regulations, and affirms such statements in the sworn affidavits attached hereto:

- 1. Panda Gila River will be engaged directly and exclusively in the business of owning and/or operating all or part of one or more eligible facilities and selling electricity at wholesale. Panda Gila River, a Delaware limited partnership, will develop, construct, own, operate and maintain an electric generating facility ("Project") as an EWG under Section 32 of PUHCA. The sole general partner of Panda Gila River is Panda Gila River I, LLC, a Delaware limited liability company, and the sole limited partner is Panda Gila River II, LLC, a Delaware limited liability company. Panda Gila River I, LLC, and Panda Gila River II, LLC, are owned by Panda Energy International, Inc., a Texas corporation.
- 2. Panda Gila River will not sell electricity at retail to any customer within the United States or any foreign country.
- 3. The Project will be a 2000 MW natural gas-fired generating facility consisting of four high-efficiency "F" technology combustion turbines and two condensing steam turbines. It will be constructed and installed in Maricopa County, Arizona, in the region governed by the Western Systems Coordinating Council ("WSCC"). The Project is expected to commence service in 2002. The Project will be operated as a combined cycle merchant plant. All of the electricity generated by the Project will be sold at wholesale to one or more power marketers, utilities, cooperatives or other entities. The Project, therefore, will be an eligible facility as defined in Section 32(a)(2) of PUHCA.

- 4. The Project includes certain interconnection facilities necessary to effect the sale of electric energy at wholesale. These facilities include switches, revenue meters, circuit breakers, transformers, transmission lines, and a 500 kV "radial bus" air insulated substation located at the Project site which are necessary to connect the Project to the 500 kV grid. Panda Gila River may own some or all of these interconnection facilities.
- 5. There are no lease arrangements involving the Project and specifically, no portion of the Project will be leased to any public utility company.
- 6. The Project has not yet been constructed. No rate or charge for or in connection with the construction of the Project or for electric energy produced by the Project ever has been in effect under the laws of any state. No portion of the Project will be owned or operated by any "electric utility company" that is an "affiliate" or "associate company," as those terms are defined in PUHCA, of Panda Gila River. Accordingly, Panda Gila River does not require a determination by any state commission allowing the Project to be an eligible facility.
- 7. A copy of this application is being served on the Secretary of the Securities and Exchange Commission, and upon the Arizona Corporation Commission, which is the only affected state commission as defined in Section 365.2(b)(3) of the Commission's regulations.
- 8. A Notice of Application suitable for publication in the Federal Register is attached hereto. Enclosed is a 3.5 inch diskette containing the Notice of Application.
- 9. Panda Gila River will not become a "public utility" upon the sale of electric energy at wholesale.

#### III. Conclusion

Based on the foregoing facts and representations, Panda Gila River, L.P. respectfully requests the Commission to determine that it is an exempt wholesale generator.

Respectfully submitted,

James K. Teringo, Jr.

Assistant General Counsel

Panda Energy International, Inc.

4100 Spring Valley, Suite 1001

Dallas, Texas 75244

Tel.: (972) 980-7159

Fax: (972) 980-6815

Attorney for Panda Gila River, L.P.

#### VERIFICATION

I, Hubbald, being duly sworn, hereby attest: that I am a representative legally authorized to bind Panda Gila River, L.P.; that I have read the foregoing Application for Determination of Exempt Wholesale Generator Status and I am familiar with the contents thereof; and that the statements contained therein are true and correct to the best of my knowledge, information and belief.

PANDA GILA RIVER, L.P.

By Panda Gila River I, LLC, Its General Partner

Name: Garry N. Hubbard

STATE OF TEXAS )
COUNTY OF DALLAS )

Sworn and subscribed to before me this 19th day of Sanuary 2000.

My Commission Expires: 1/-12-01

(Notary Seal)

CYNTHIA GOMEZ
Notary Public
State of Texas
My Comm. Exp. 11-12-01

# UNITED STATES OF AMERICA BEFORE THE FEDERAL REGULATORY COMMISSION

Panda Gila River, L.P.	) )	000
	CATION FOR DETERMINATION LESALE GENERATOR STATUS	
the Federal Energy Regulatory Comm	Gila River, L.P. ("Panda Gila River" by Road, Suite 1001, Dallas, Texas 75244 mission, an application for determination of Section 32 of the Public Utility Holding 5 of the Commission's regulations.	n of exempt
operate a 2000 MW natural gas-fired	re limited partnership, which will construd generating facility within the region guncil ("WSCC") and sell electricity at when	governed by
generator status should file a motion Regulatory Commission, 888 First St with §§385.211 and 385.214 of the C Commission will limit its consideration accuracy of the application. All before, and must before, and must before,	ard concerning the application for exempto intervene or comments with the Fed treet, N.E., Washington, D.C. 20426, in commission's Rules of Practice and Procon of comments to those that concern the such motions and comments should be be served on the applicant. Any person intervene. Copies of this filing are on folic inspection.	eral Energy accordance redure. The ne adequacy filed on or a wishing to
	Dave P. Boeger Secretary	S

#### CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of the foregoing document, by first-class mail, upon the Securities and Exchange Commission and the Arizona Corporation Commission.

Dated at Dallas, Texas this Athday of Sanuary, 2000.

James K. Teringo, Jr.

Panda Energy International, Inc. 4100 Spring Valley Road, Ste. 1001

Dallas, TX 75244 Tel.: (972) 980-7159 Fax: (972) 980-6815

# Panda Gila River Project

# **Ambient Noise Measurement and Noise Impact Assessment Report**

January 2000

Presented by:

Environmental Planning Group, Inc. Phoenix, Arizona

Prepared by:

PCR Services Corporation Irvine, California



#### Introduction

This report summarizes the results of (a) an ambient noise survey at the proposed Panda Gila River Project site and (b) a preliminary noise evaluation of future noise levels that will be generated by plant operations. The total nominal power generation from the proposed natural gas-fired, combined-cycle plant is 2,000 megawatts (MW).

The overall objectives of this study were to measure existing noise levels in the immediate vicinity of the project site, predict the future noise emissions from the proposed plant, and compare those results to existing noise levels and applicable criteria.

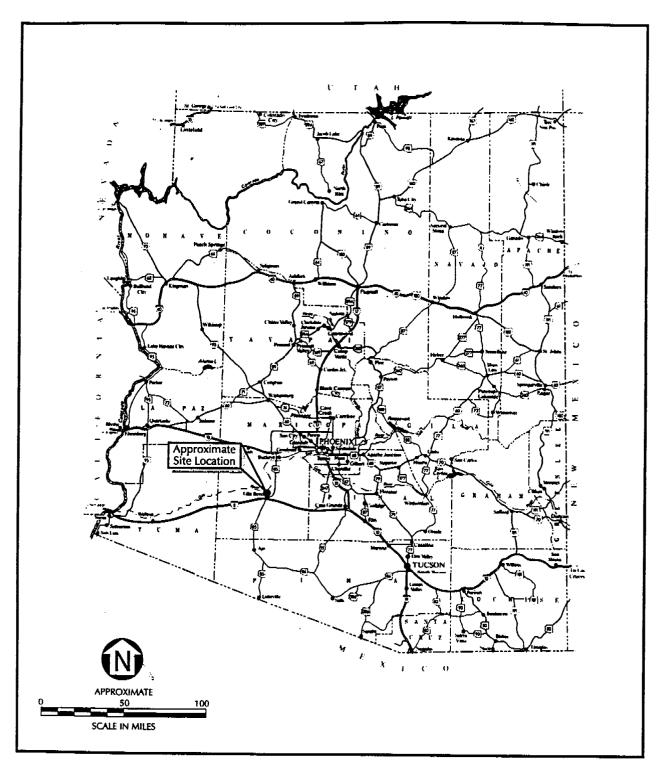
The City of Gila Bend is in the southwest quadrant of the state of Arizona. As shown on Figure 1, Gila Bend is approximately half-way between Tucson and Yuma, AZ as is about 1½ hours driving time southwest of Phoenix, AZ. The project site is located northeast of the city; specifically, east of Stout Road (299<sup>th</sup> Ave.), and north of Watermelon Road. The project site is situated west of Old Highway 80. Figure 2 shows the plot plan of the project site and nearby vicinity.

The ambient noise monitoring survey was conducted on November 1 through 3, 1999 to quantify existing ambient noise levels in the vicinity of the Proposed Panda Gila River Project. Four measurement locations were selected on the project site to define the existing ambient noise conditions near the most likely placement of the power generation facility. Noise data were continuously acquired for over 40 hours to assess both the daytime and nighttime conditions. Additional, short-term measurements were made at selected locations in and around the city.

The preliminary predictive noise evaluation focused on the noise generated by the major noise sources in the proposed facility; most notably the:

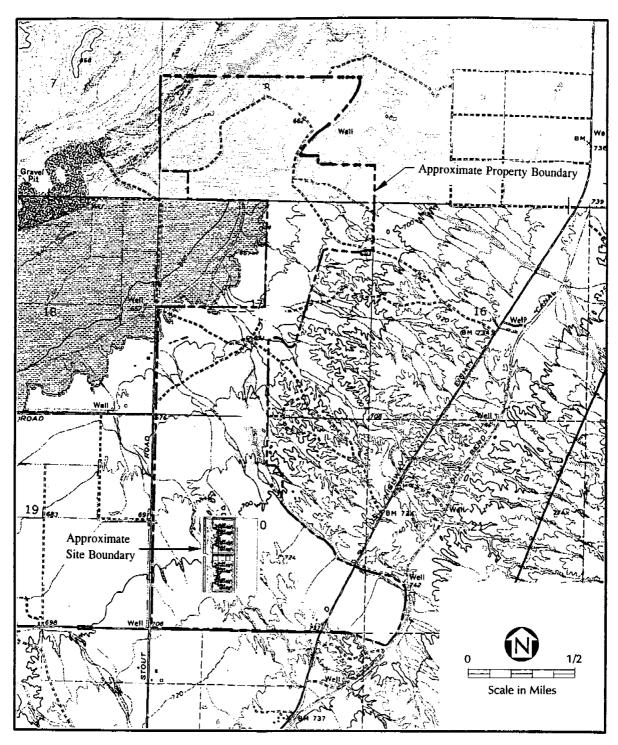
- eight trains of Gas Turbine Generators (GTG's)
   [currently envisioned to be General Electric model 'Frame 7FA' units],
- eight Heat Recovery Steam Generators (HRSG's) and deaerators,
- four Steam Turbine Generators (STG's) with steam condensers,
- twelve large power transformers,
- several sets of large water pumps, and
- four 1x9-cell wet Cooling Towers.

The evaluation utilized computer simulation models to predict future noise level emissions from the plant at pertinent receptor locations and to produce noise level contours associated with the plant operations.



Source: Dames & Moore

Figure 1. General Location of the Project Site



Source: Dames & Moore (base map) and Environmental Planning Group (plant location)

Figure 2. Plot Plan of the Project Site and Nearby Vicinity

#### Ambient Noise Measurements

Four Larson-Davis (LD) Model 820 Sound Level Meters and a Brüel and Kjær (B & K) model 4230 Acoustic Calibrator, were used to conduct the ambient noise measurements. All instrumentation was within the standard laboratory calibration cycle and all meters were operated according to the manufacturer's specifications (calibration records are available upon request). Also, all equipment was field calibrated during the various measurement sessions and experienced no more than 0.2 dB drift during the measurement program. The following instruments were used in the noise measurements:

- 1. LD 820 Sound Level Meters, SN A1049, A1065, 0996, and 0997
- 2. LD 2560 ½" Microphones, SN 2780, 2765, 2715, and 2726
- B & K 2230 Sound Level Meter, SN 1327384
- 4. B & K 1625 Filter Set, SN 1333338
- 5. B & K 4155 ½" Microphone, SN 1479419
- 6. B & K 4230 Acoustic Calibrator, SN 1472686

Continuous noise measurements were conducted at four locations along the project site's perimeter to quantify baseline ambient noise levels. Figure 3 shows the location of the noise monitors relative to the project site and nearby roadways. The continuous measurements were started in the evening of Monday November 1, 1999 and continued to approximately 10 A.M. of Wednesday November 3, 1999; an approximate span of 42 hours. The sound level instrumentation was set to sample, process, and store data continuously over 30-minute sampling durations.

In addition to the continuous, on-site monitoring, intermittent, short-term sampling measurements were also made over 5- to 15-minute sampling periods at selected receptor locations throughout the City of Gila Bend during various daytime and nighttime periods. These short-term measurement locations, shown in Figure 4, included the City Hall/Council Chambers parking lot, a residential neighborhood on Merritt Parkway, Gila Bend High School, San Lucy Village, and the Gatlin (archeological) Site.

For all measurements, each Sound Level Meter (SLM) system was calibrated before the start of the measurement with a portable, field acoustic calibrator. The long-term noise monitoring was attended during portions of the measurement period, both daytime and nighttime, to identify and document the sources which contributed to the ambient noise environment. In addition, meteorological conditions (air temperature, relative humidity, wind speed, and wind direction) were observed and noted. After completion of the measurement program, a calibration check was performed on each SLM to determine if the instrument was operating properly and if there was calibration drift.

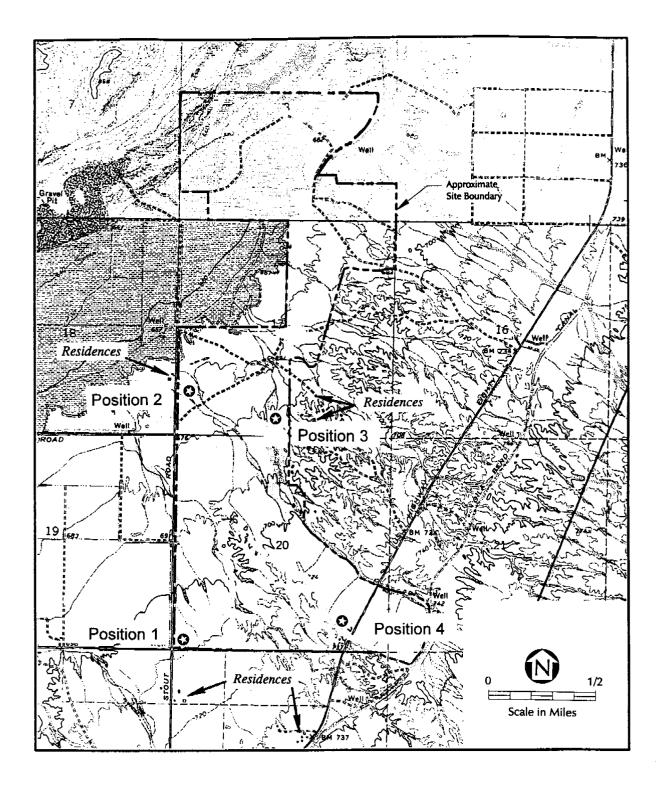


Figure 3. Approximate Location of Noise Measurement Positions at the Project Site

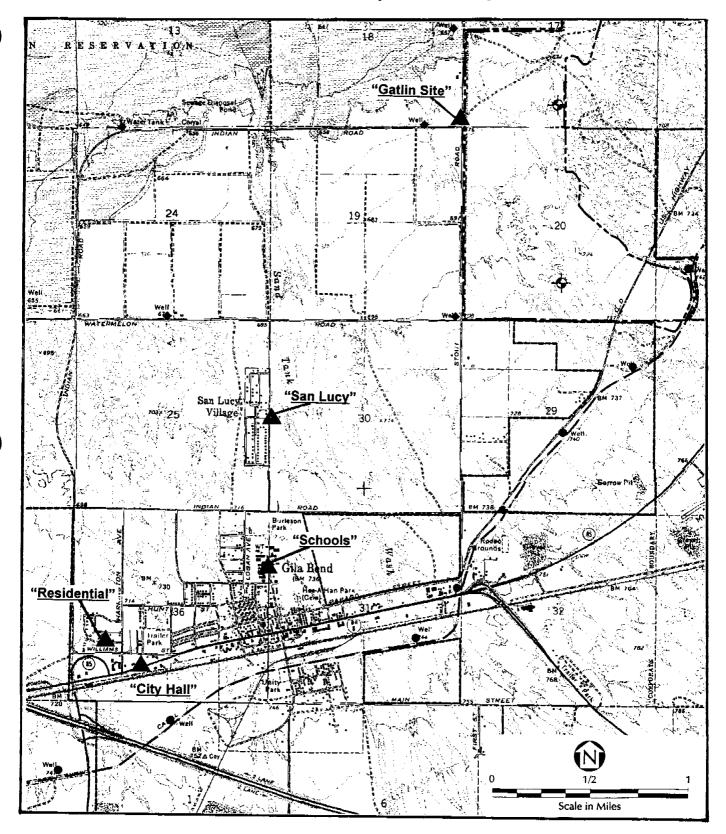


Figure 4. Approximate Location of Short-Term Noise Measurement Positions in and around the City of Gila Bend

#### **Site Conditions**

The Gila Bend area is in a broad alluvial basin that is relatively flat throughout. The majority of land uses outside of the city proper, including the project site, are (undeveloped) native desert land or are used for agricultural uses (mostly cotton and alfalfa fields). The project property is approximately 1,000 acres of land which ranges in elevation from 700 to 740 feet above mean sea level (with a topographic gradient of approximately 30 feet per mile)<sup>1</sup>. There are no major topographic features on the property or immediately adjacent to it. The project site (i.e. power plant and related equipment) is approximately 60 acres of land.

Land uses in the immediate vicinity of the measurement site are comprised of farm land, undeveloped desert land, and sporadic farm/ranch residences ("farmsteads") of unknown occupancy rates. The nearest houses or farmsteads to the proposed power plant site were observed to be south from the property along Stout Road, south of Watermelon Road (near ambient location 1), adjacent to the project property on the east (near Well No. 2 and ambient location 3) and adjacent to the project property to the west across Stout Road (near ambient location 2). There are additional farmsteads on Stout Road, further south of Watermelon Road. The number of farmsteads/residences within approximately ½-mile of the project site boundary was observed to be less than ten houses.

Weather conditions during the survey sessions were noted to be typical for the area in autumn. Daytime temperatures (°F) ranged from the mid-70's to the mid-90's. Evening and nighttime temperatures (°F) ranged from the mid-60's to the mid-70's. The relative humidity was typically less than 20%. Mild winds (0 to 10 mph) were observed during the measurement period. These wind speeds are below the limits specified in industry standards for conducting outdoor measurements. The noise impact from the winds at these speeds is judged to be negligible, since there is a lack of heavy foliage at the site (to cause rustling noise) and since each measurement microphone included a wind screen, as is standard industry practice for outdoor measurements. There was no precipitation encountered during the measurement program.

#### **Ambient Survey Measurement Results**

The predominant noise sources observed at the property were quite consistent at all four measurement positions. These sources included insects, vehicular traffic on nearby and distant roadways, distant train pass-bys, aircraft operations, farm equipment, wind

<sup>&</sup>lt;sup>1</sup> Source: Dames & Moore, Phase I Environmental Site Assessment, Well Inspection, and Groundwater Quality Evaluation, Report 42673-001-050, March 30, 1999.

rustling, dogs barking, cows, wildlife (birds and coyotes), and electrical power line noise. In general, the average ambient noise levels, denoted  $L_{eq}$ , were in the following ranges:

Position	Boundary	Noise Level Range, L <sub>eq</sub>	Prominent Sources
1	Northeast corner of Stout and Water- melon	30 to 55 dBA	Aircraft, trains, truck traffic, dog barking, birds, car pass-by, power line noise, insects, Highway 85 traffic
2	Northeast of the cor- ner of Stout & Indian	24 to 53 dBA	Barking dogs, cows, coyotes, birds, trains, aircraft, insects, Highway 85 traffic, farm equipment
3	East boundary (south of Well #2)	27 to 57 dBA	Power line noise, Highway 85 traffic, aircraft, wind, insects, farm equipment
4	South boundary (west of Old Hwy 80)	35 to 55 dBA	Old Highway 80 traffic, Highway 85 traffic, trains, aircraft, insects, wind, car pass-bys

The prevailing noise levels at the site are deemed to be typical for a sparsely-populated and primarily-agricultural area in proximity to active highway, railway, and general aviation flight corridors. Figure 5 shows four graphical representations of the  $L_{\text{max}}$ ,  $L_{\text{eq}}$ , and  $L_{\text{min}}$  noise levels measured at Positions 1 through 4, respectively. These charts show the variations in noise levels attributable to intermittent human and natural activities at each measurement position.

The average ambient noise levels were also measured at specific locations within the City of Gila Bend during the day, mid-afternoon, early evening, and late night. These short-term measurements were conducted to provide a representation of typical current background noise conditions at common locations throughout the city.

Location	Noise Level Range, L <sub>eq</sub>	Prominent Sources
City Hall/Council Chambers Parking Lot	52 to 69 dBA	Traffic on Pina Road, Train pass-bys, dogs, distant residential activities, wildlife
Residential Area, 800 block of Merritt Parkway	41 to 53 dBA	Distant traffic, birds, dogs, cats, general aviation aircraft operations, helicopters, car pass-bys, military jet, trees rustling in wind
Gila Bend High School, (near the Jr. High and ele- mentary school)	43 to 56 dBA	Wind rustle, students at recess and dismissal, lawn mower, traffic, air conditioning units, electrical noise, dogs, trees rustling
San Lucy Village	40 to 50 dBA	Garbage truck, wind rustle, residential activities, distant traffic, air conditioning units
Gatlin Site	29 to 38 dBA	Wind, distant traffic, insects, power lines

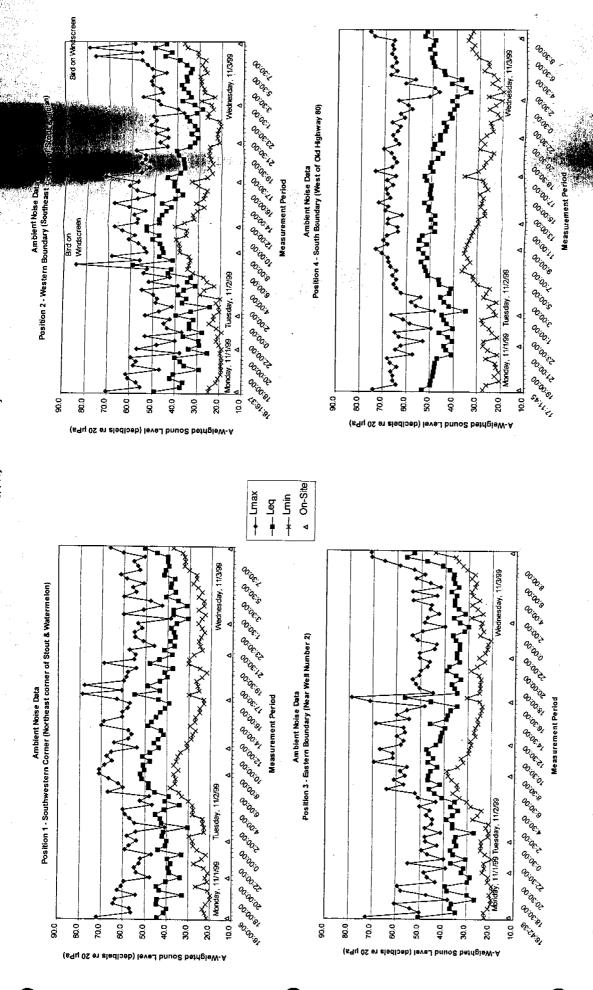


Figure 5 Graphical Representations of the Lmax, Leq, and Lmin noise levels measured at Positions 1 through 4

#### **Noise Criteria**

There are no known federal, state, county, or City of Gila Bend noise standards applicable to the community noise emissions from the proposed facility. In lieu of definitive regulatory requirements, there are some noise level guidelines that may be used for a comparative framework.

Sound can interfere with human activities by limiting speech communications or the ability to listen to the telephone, radio, or television. Noise can also interfere with concentration and with sleep. The potential for activity interference from noise has been considered by the United States Environmental Protection Agency (U.S. EPA) in their milestone document. In this document, the U.S. EPA recommends that noise levels at residential locations not exceed a day-night sound level, denoted  $L_{\rm dn}$ , of 55 dBA in order to "protect the public health and welfare with an adequate margin of safety". According to EPA's studies, exposure to noise levels at or below  $L_{\rm dn}$  = 55 dBA will not produce significant speech interference either indoors or outdoors, and will lead to negligible community reaction, complaints, or annoyance in average communities. Sleep disturbance was not considered in the development of the EPA's guideline and the guideline is not based on any considerations of technical or economic feasibility. Note that the EPA recommendation of  $L_{\rm dn} \leq 55$  dBA is a *guideline* value and not a regulatory limit (EPA has no authority to establish or enforce such a limit).

In addition, the health and safety of power plant workers should be considered. For example, prolonged exposure to very loud sounds can lead to loss of hearing. Physiological stress effects, such as changes in heart rate, increased blood pressure, etc., have also been observed in people working in high noise areas. Precluding the potential for hearing damage to people at work is the basis for the occupational noise limits promulgated by the U.S. Occupational Safety and Health Administration (OSHA).<sup>4</sup> These OSHA limits are much higher than the noise levels normally encountered in residential areas. Specifically, workers are limited to a time-weighted average sound level of 90 dBA per 8-hour shift. If noise over an 8-hour exposure routinely exceeds 85 dBA, then a hearing conservation program would be required to ensure worker safety. Further, to avoid hearing loss, the EPA recommends an 8-hour workday exposure limit of  $L_{eq} = 75$  dBA for industrial-zoned

<sup>&</sup>lt;sup>2</sup> There is wide variability among people — and from occurrence to occurrence for a given person — in the effects of sound on sleep.

<sup>&</sup>lt;sup>3</sup> "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety", U.S. EPA Document 550/9-74-004, March, 1974.

<sup>&</sup>lt;sup>4</sup> Regulations found in the Code of Federal Regulations, 29 CFR, Ch. XVII, §1910.95.

locations immediately abutting a significant stationary noise source, such as a power plant.

The proper design of the power plant, the assessment of noise from mechanical equipment, and the accounting for typical operations patterns at this type of facility should yield an acceptable in-plant noise environment, per OSHA regulations.

When evaluating noise impacts, it is important to remember that noise guidelines and regulations are attempts to set objective, qualitative limits to sounds – something that can be readily measured with an instrument – to protect against a human reaction that is typically subjective. Although sound limits may be discrete numbers, human reactions can be highly variable. Noise in communities is almost always a quality-of-life issue and almost never a health issue. As such, it is appropriate that noise regulations or guidelines be protective of the "average" community or of "most" persons. It is not possible to protect everyone in all situations, just as it is not possible to tell people what will or will not annoy them.

#### **Evaluation and Analysis of Future Power Plant Noise**

Future noise from the plant can be divided into two types: temporary noise emissions due to constructions activities and on-going noise emissions from the operation of the plant.

# Construction Noise (Temporary)

Noise from construction activity is typically a function of the noise generated by construction equipment, the equipment location, the sensitivity of nearby land uses, and the timing and duration of the noise-generating activities. Construction is anticipated to take place in five fairly distinct phases: (1) ground clearing; (2) grading/excavation; (3) foundation construction; (4) construction erection; and (5) finishing and site cleanup. The highest level of construction noise is expected to be generated during the ground clearing and grading/excavation phases. An  $L_{eq}$  value as high as 89 dBA at 50 feet from the center of construction activity would be generated during specific periods of clearing, grading, and excavation. During other stages of construction, the  $L_{eq}$  would be lower and would vary, depending on the amount of activity and the types of equipment in use. Typical construction noise levels generated during each phase of construction are shown in the table on the following page.

#### Typical construction noise levels

	Noise Level (dBA) at 50 feet		
Construction Stage	Minimum Required Equipment in Use	All Applicable Equipment in Use	
Ground Clearing	83	84	
Grading & Excavation	79	89	
Foundation Construction	78	78	
Building Construction	75	85	
Finishing and Site Cleanup	75	89	

Source:

Bolt, Beranek and Newman, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," prepared for the U.S. EPA, December 31, 1971.

The noise levels discussed above would be experienced intermittently and only temporarily during periods of heavy construction. During periods of reduced activity, lower noise levels would be expected.

#### Operations Noise (On-going after Start-up)

A PC-based noise prediction program was used to simulate and model the noise propagation from the Panda Gila River Project. This model utilizes industry-accepted propagation algorithms based on standards written by CONCAWE<sup>5</sup>. The calculations account for classical sound wave divergence (spherical spreading loss with adjustments for source directivity from point sources) plus attenuation factors due to air absorption, simple ground effects, and barrier/shielding. The computer outputs are in terms of sound pressure levels (abbreviated SPL or L<sub>p</sub>) at discrete receptor positions or at grid-map nodes (in preparation for computing a contour map). This model has been validated over the years via noise measurements at several operating plants that had been previously modeled during the engineering design phases.

The overall plot plan drawings of the currently-proposed facility<sup>6</sup> were used to establish the position of the plant sources. The ambient noise survey locations were used to

<sup>&</sup>lt;sup>5</sup> CONCAWE is the oil companies' European organization for environment, health, and safety; headquartered in Brussels, Belgium. The noise propagation standard was originally published in 1981 under the title "The propagation of noise from petroleum and petrochemical complexes to neighboring communities". Parts of this method are also included in the ISO 9613, ISO 1913 (Part 1), ANSI 126, or ISO 3891 standards.

<sup>&</sup>lt;sup>6</sup> Power Plant Facility Layout drawing provided by Environmental Planning Group (EPG) on December 8, 1999 and Overall Property Drawing provided by EPG on December 15, 1999.

establish the receptor locations with respect to the facility layout. The source locations and receptor locations were translated into input x, y, z coordinates for the noise modeling program.

All continuous-operation equipment items that were deemed to be significant noise sources at the Panda Gila River Project were included in the noise model. The set of modeled sources included gas turbines, steam turbines, large pumps and motors (i.e. greater than 50 horsepower), main transformers, fans and blowers, and cooling tower cells.

The plant was assumed to operate 24 hours per day, which means its noise output would be constant, regardless of time-of-day. Given the early stages of the project, no equipment vendor data is currently available. Rather, extensive experience with similar power plants as well as standard acoustical estimation techniques were employed to arrive at the nominal noise emissions numbers for the modeling inputs. Specifically, equipment types and sizes that have been used on several recent Panda power projects in the last year were also assumed for this project. Major buildings were included as barriers, but, for conservatism, large equipment trains (such as the HRSG's or the Gas Turbines) were not considered as barriers. These initially-estimated (nominal) sound emissions values were modeled to calculate the expected noise levels at the selected receptor locations.

#### Modeling Results

The modeling shows that the power plant fenceline will experience levels in the low-to mid-70's dBA range. This is quite typical for a power plant of this size. Further, noise levels are predicted to be approximately 65 dBA along the southwest edges of Section 20 (i.e. the 'heel' of the boot), 55 to 60 dBA along the east and southeast portions of Section 20 (i.e. the 'toe' of the boot), 55 dBA along the southern portion of Section 17, 50 dBA in the middle of Section 17, and 45 dBA and below in Section 8.

Off the project site, the far-field, community noise levels that are predicted from the plant operations are summarized in the following table (italicized column) along with the other pertinent noise level characteristics at each receptor location.

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#### Summary of Receptor Noise Levels

Measurement Location	Approx. Distance to Center of Plant (miles)	Daytime Ambient Noise Level, L <sub>eq</sub> dBA	Nighttime Ambient Noise Level, L <sub>eq</sub> dBA	Preliminary Predicted Plant Contributions, dBA (without ambient)
Northeast corner of     Stout and Watermelon	0.4	40-50	35-40	63
Northeast of the corner of Stout & Indian	0.9	40-50	30-40	53
East boundary,     south of Well #2	0.7	42-47	32-38	56
South boundary,     west of Old Highway 80	0.5	48-55	40-50	60
"Residential"	3.0	47-53	41-44	38
"City Hall"	2.9	61-69	52-55	39
"Schools"	2.1	51-66	43-45	43
"San Lucy"	1.6	50	40	47
"Gatlin Site"	0.8	38	29	55

Note: 2 dB should be added to the predicted plant contributions (italicized column) to convert to an approximate day-night level,  $L_{d\alpha}$ .

The same set of noise sources was then used to create a noise contour map of the proposed facility. Figure 6 shows constant A-weighted sound level contours, in 5 dB increments, for the currently-planned project site. In general, the results are consistent with what would be expected for a large, combined-cycle power generation plant that utilizes wet cooling towers.

#### Potential Impacts

Potential noise-related impacts would be associated with the temporary construction activities, typically lasting less than two years for a plant of this size, as well as with the ongoing operations of the plant once it is commissioned for power production service.

#### **Construction Noise Impacts**

Since the closest current receptors are approximately 0.7, 0.9, and 1.0 miles (3,700 feet, 4,750 feet, and 5,300 feet, respectively) from the center of the power plant area, the

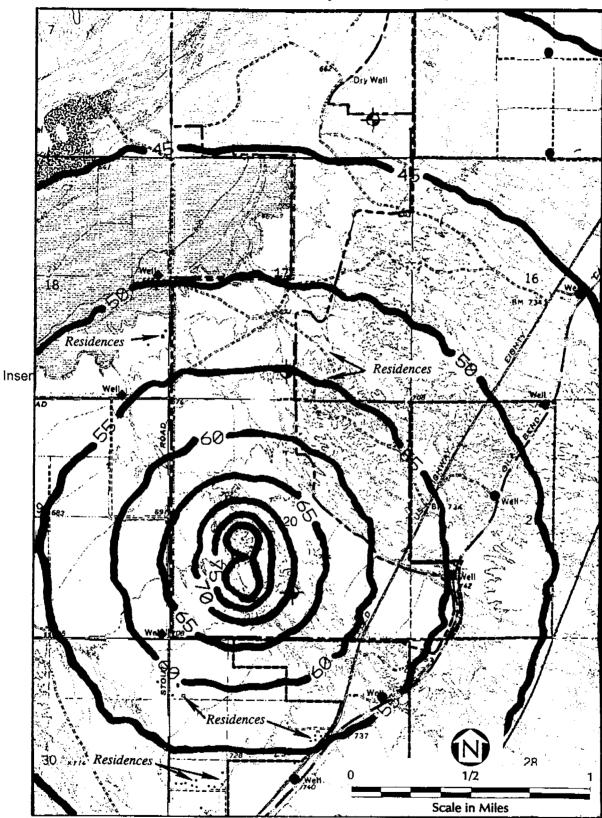


Figure 6. Predicted Noise Level Contours at Project Site, A-weighted Sound Pressure Levels, dBA

noise from all applicable equipment in use during the noisiest phases would be expected to be on the order of 52 to 48 dBA at these locations. These construction noise levels would probably be clearly discernible over the existing ambient, but they are below the U.S. EPA guidelines for activity interference. Furthermore, construction activities would probably be limited to only daytime periods, so there should be no impacts to receptors' evening activities or sleeping routines.

#### On-going Operations Noise Impacts

The modeling results for the power plant, as currently envisioned, indicate noise levels in the mid- to high-50's dBA for the closest residential receptors (near ambient survey locations 1, 2 and 3), approximately 46 to 47 dBA at the San Lucy Village, and in the upper-30's to low-40's dBA range for the majority of residential areas in the City of Gila Bend. In general, the area receptors, and their respective potential impacts, can be grouped into three categories as follows:

Category (based on distance from the plant)	Summary of Potential Impacts	
Receptors less than one mile from the plant center	May be 2 to 3 dB above the U.S. EPA guideline for activity interference for residential areas ( $L_{dn} \le 55$ dBA). Due to the very limited development around the plant and the associated low ambient noise levels, the power project contributions will be significantly above the existing noise conditions and will, thus, be readily discernible during both the daytime and nighttime periods.	
Receptors between one mile and two miles from the plant center	Can be expected to be at (-0 dB) or well below (-10 dB) the U.S. EPA guideline value. The power plant noise will range from barely discernible (at two miles) to clearly discernible (at one mile), given the typical existing ambient condition	
Receptors more than two miles from the plant center	Can be expected to be 10 to 15 dB or more below the U.S. EPA guideline value. The power plant noise would not be expected to be discernible at any time, day or night, except at the very quietest lulls in typical activities (i.e. no trains, no highway traffic, and no insects).	

On Stout Road, south of Watermelon Road (0.7 mi.), east of ambient location 3 (0.9 mi.), and on Stout Road, north of Indian Road (1.0 mi.).

# **Conceptual Mitigation Measures**

Construction noise mitigation measures could include:

- Construction could be restricted daytime hours. No noise-generating construction activities should take place on Sundays or holidays.
- Noise-generating construction equipment should be fitted with the most modern and effective noise control devices (e.g. mufflers, lagging, and/or engine enclosures).
   All equipment should be properly maintained to assure that no additional noise, due to worn or improperly-maintained parts, would be generated.
- Truck deliveries and haul-offs could have restricted hours and should use approved haul routes.

For the on-going operations of the Gila River plant, the following conceptual mitigation methods could be investigated:

- Take the graded dirt from the power plant area and build up earthen berms to serve as noise barriers, as needed.
- The judicious specification and procurement of noise control features for major equipment items.

The above conceptual mitigation measures, as well as others that may arise during later stages of the project, should be investigated and implemented, as appropriate, to reduce the power plant's noise emissions into the surrounding areas as much as practical.